THE JOURNAL OF GAS LIGHTING
WATER SUPPLY & SANITARY IMPROVEMENT

VOL. LVI. No. 1432.] LONDON, OCTOBER 21, 1890. [42ND YEAR. Price 6d.

THE SILICA FIRE-BRICK COMPANY,
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SILICA BLOCKS, BRICKS, AND CEMENT
OF SUPERIOR QUALITY
FOR GAS-FURNACES.
Trade Mark: "SILICA."
These Goods (largely used in Gas, Glass, Iron, and Steel Works) are, on account of their
GREATER DURABILITY,
Strongly recommended where EXCESSIVE HEATS have to be maintained.

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THE ONLY MAKERS OF
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Parker's Imperial Black Varnish,
Oxide Paints, Oils, and General Stores for Gas and Water Works.
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Special Quotations to Gas Companies.
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MANUFACTURED BY
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ESTABLISHED 1811—OVER THREE QUARTERS OF A CENTURY.
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Under G. R. HISLOP'S PATENTS
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Hislop's Patent Producer and Patent Charging Appliances offer advantages which are unapproachable, while in every other detail his Settings are confidently recommended as being the most inexpensive and effective possible.
Illustrated Pamphlet and Terms on application to J. E. FISHER, Stourbridge, Agent for England and Wales; to C. M. HAMILTON, Portland Place, Hamilton, Agent for Scotland and Ireland; and for all other Countries to the Patentee,
Geo. R. HISLOP, Gas Engineer, PAISLEY, N.B.

C. & W. WALKER.
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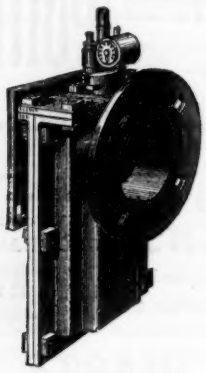

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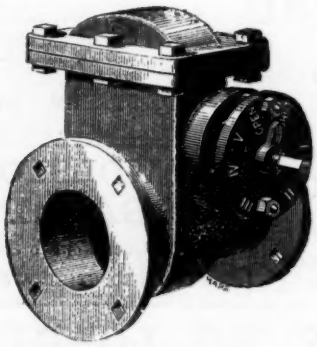

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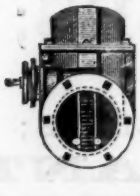

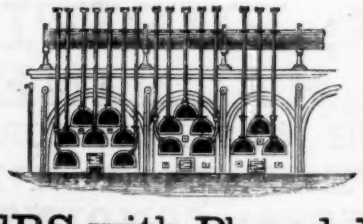

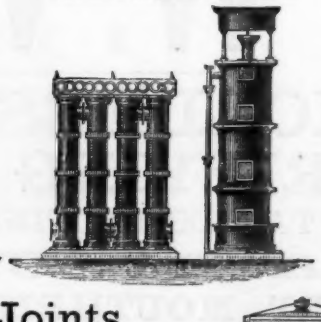

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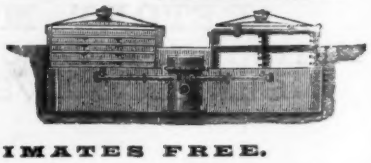

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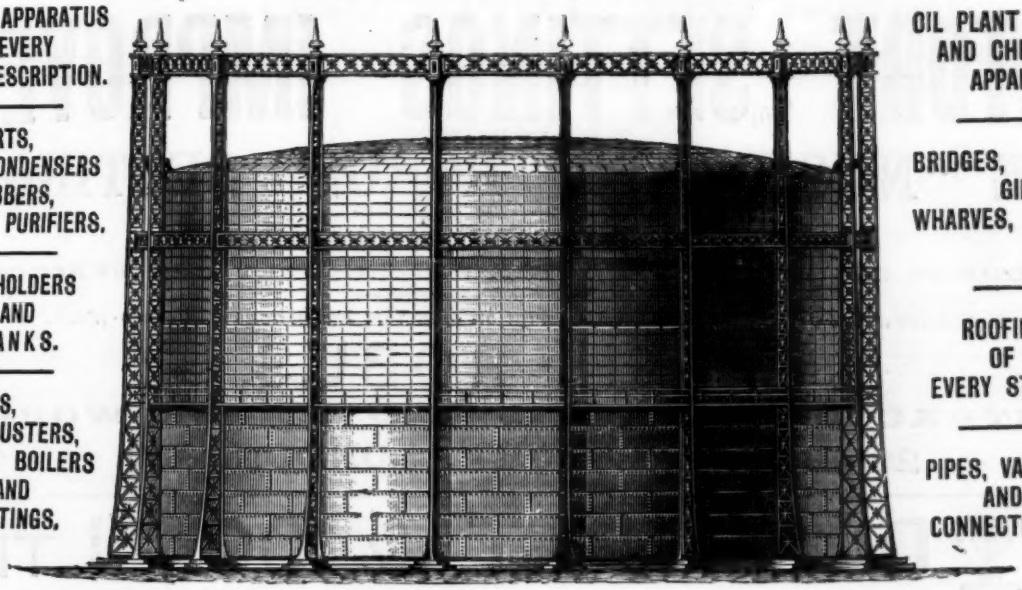

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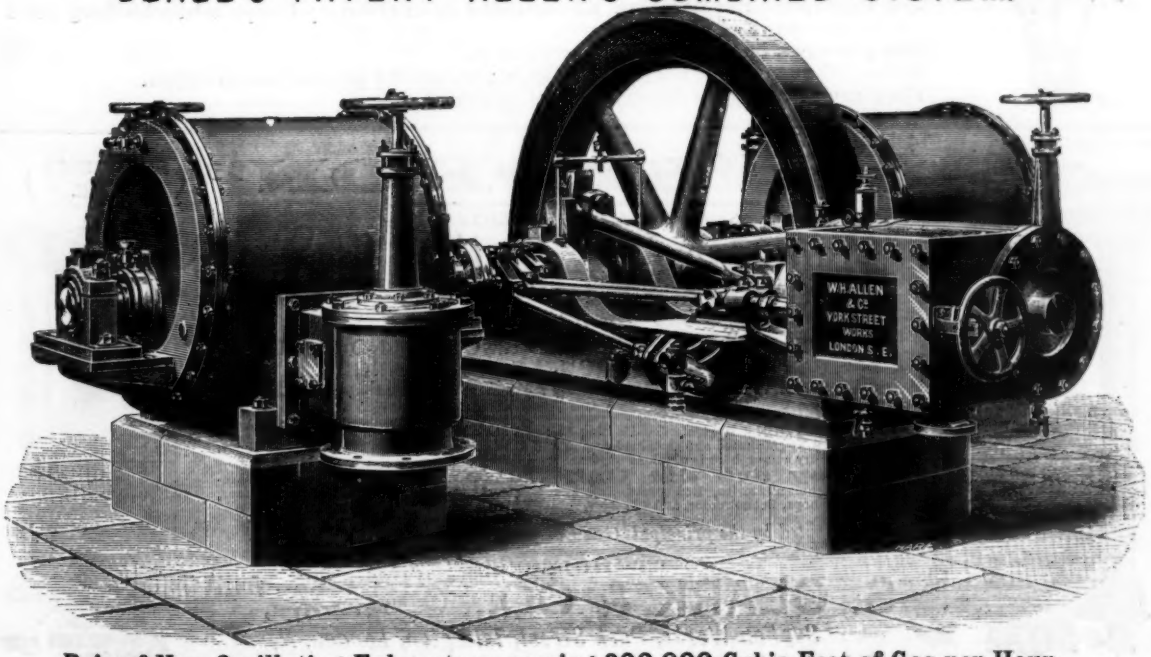

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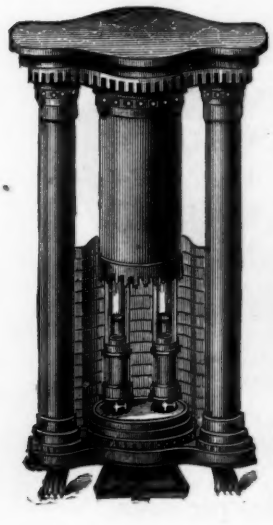

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Hygienic Gas-Heating Stoves

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NO DIRT OR TROUBLE. NO DANGER.

All sulphurous Vapours are condensed inside the Stoves, and passed off as liquid into the tray beneath.

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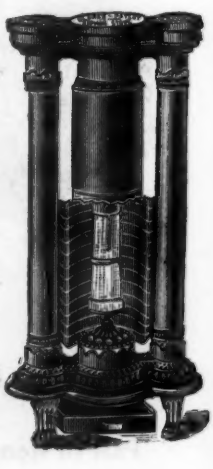
They are the Only Safe Stoves for use in Greenhouses, Conservatories, Bed-rooms, &c., and especially suitable for Halls, Sitting-Rooms, Offices, Shops, Schoolrooms, and Theatres.

Adopted by the principal Gas Companies throughout the Kingdom.



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OVER **160** MACHINES AT WORK AND IN COURSE OF CONSTRUCTION.

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POWER CHARGING AND DRAWING MACHINES, driven by WIRE ROPE, STEAM, or COMPRESSED AIR.—The power machines are applicable to circular, oval, or D-shaped retorts and mouthpieces, and are the most perfect, economical, efficient, and durable machines made. They are constructed on principles founded by long and extensive experience in this special branch of gas engineering and the manufacture of gas.

Sole Makers of **Circular, Oval,** or D-Shaped **Mouthpieces,** with Morton's Self-Sealing Lids fitted with

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which, by a simple wedging action at each end of the crossbar, secure a very tight joint; and at the same time, by their long sliding motion, they effectually remove the tar or other matter from the surfaces of the mouthpiece and lid.

N.B.—The whole of these Fittings are made of Wrought Iron.

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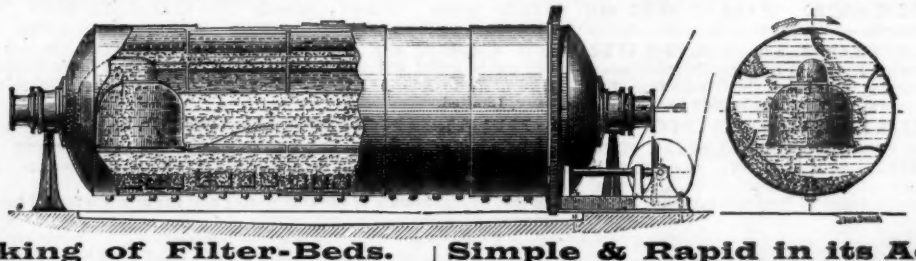

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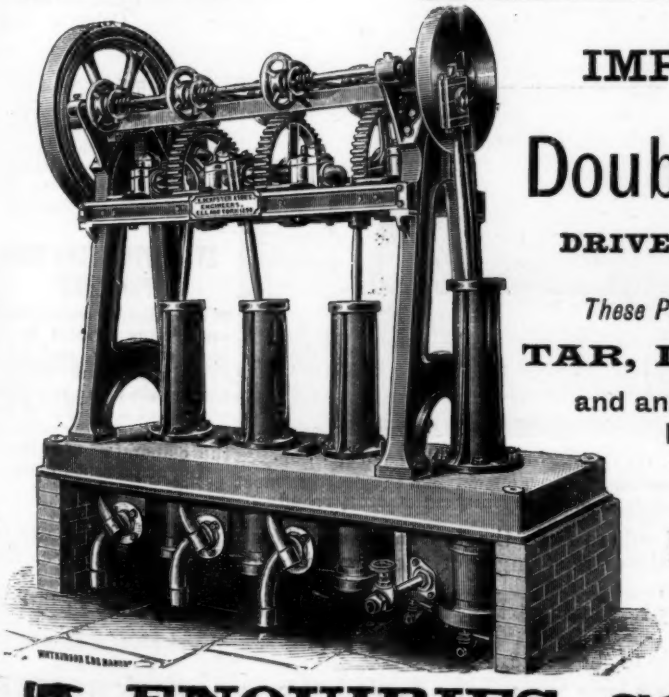

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OF THREE

Double-Acting Pumps

DRIVEN BY ONE STEAM-ENGINE.

These Pumps are fitted with Valves for pumping

TAR, LIQUOR, and WATER,

and an arrangement by which any of these Liquids may be pumped together or separately.

BEST MATERIALS AND WORKMANSHIP,

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EFFICIENCY GUARANTEED.

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CAST-IRON PIPES, ETC.

THOMAS SPITTLE, LTD.

[ESTABLISHED OVER 50 YEARS.]

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MAKERS OF

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ALSO

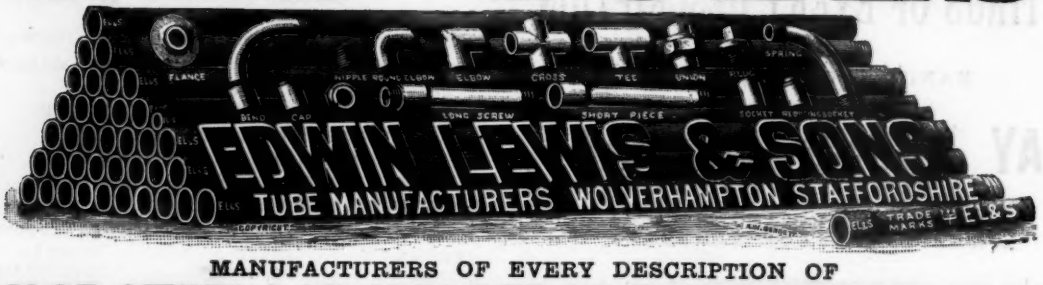
Retorts, Mouthpieces, Lamp-Posts, Hydraulic Mains, H-Pipes, Dip-Pipes, Buckstaves, Ash-pans, Sight-Holes, Syphons, Ascension-Pipes, Fire Doors and Frames, Fire-Bars, Hydrants, Valves, Purifiers, Tanks, Columns, &c., &c.

ALSO ALL WROUGHT-IRON WORK.

THE LARGEST MAKERS IN WALES.

ESTABLISHED 1825.

GAS TUBES



MANUFACTURERS OF EVERY DESCRIPTION OF

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FOR ANY PURPOSE.

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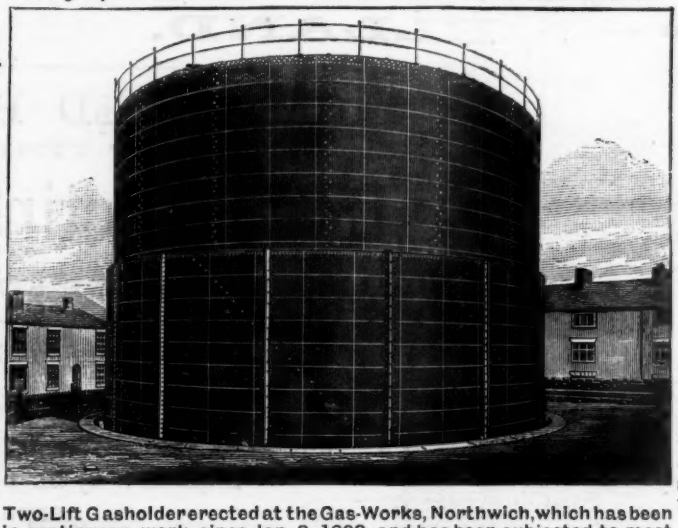
(GADD AND MASON'S PATENT).

Telegraphic Address: "SCRUBBER MANCHESTER."

TOTAL WEIGHT REDUCED
from 30 per cent. to 50 per cent.

TRANSPORT AND ERECTION REDUCED
to the same extent; and in cases where gasholders are shipped abroad to places difficult of access, this represents a very large amount of money.

TANK CONSTRUCTION SIMPLIFIED.
The Tank wall (of whatever construction) is a regular cylinder. There are no piers needed, and all expensive foundation stones for the base of columns or standards are dispensed with.



Two-Lift Gasholder erected at the Gas-Works, Northwich, which has been in continuous work since Jan. 3, 1890, and has been subjected to most severe tests from heavy gales, with perfectly satisfactory results.

COST OF PAINTING SAVED
for the Columns and Girders.

TILTING UTTERLY IMPOSSIBLE;
And as there are fewer parts, there is less liability for the Gasholder to get out of order in working.

STABILITY UNDER WIND PRESSURE
of a Gasholder constructed upon this system is at least equal to, and from experiments and calculations made is far in excess of, that of a Holder of the same dimensions guided by the elaborate guide framing at present in use.

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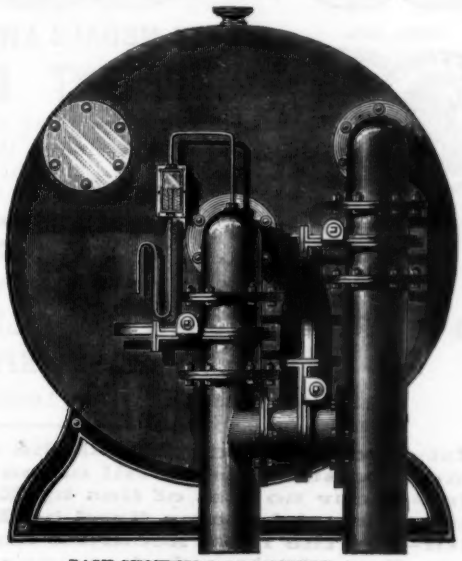

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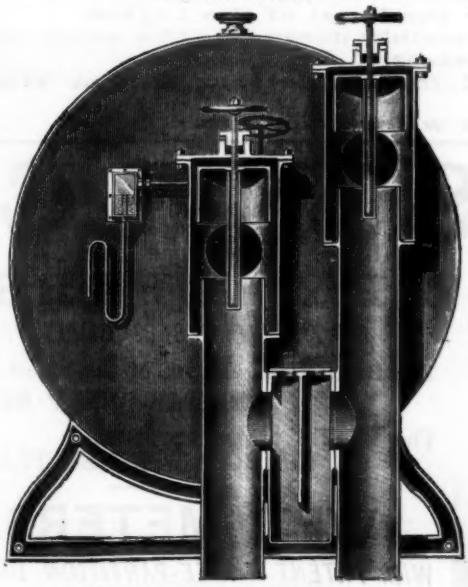

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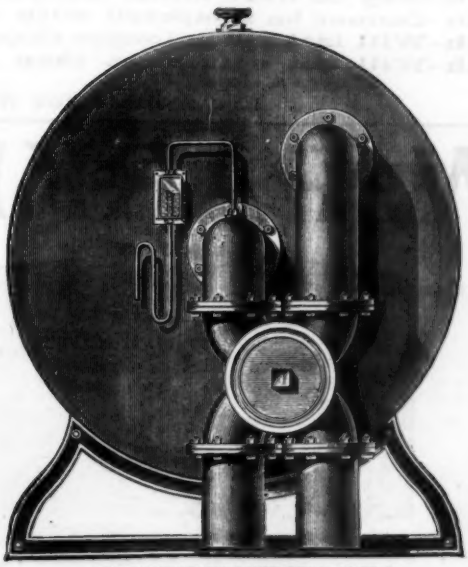

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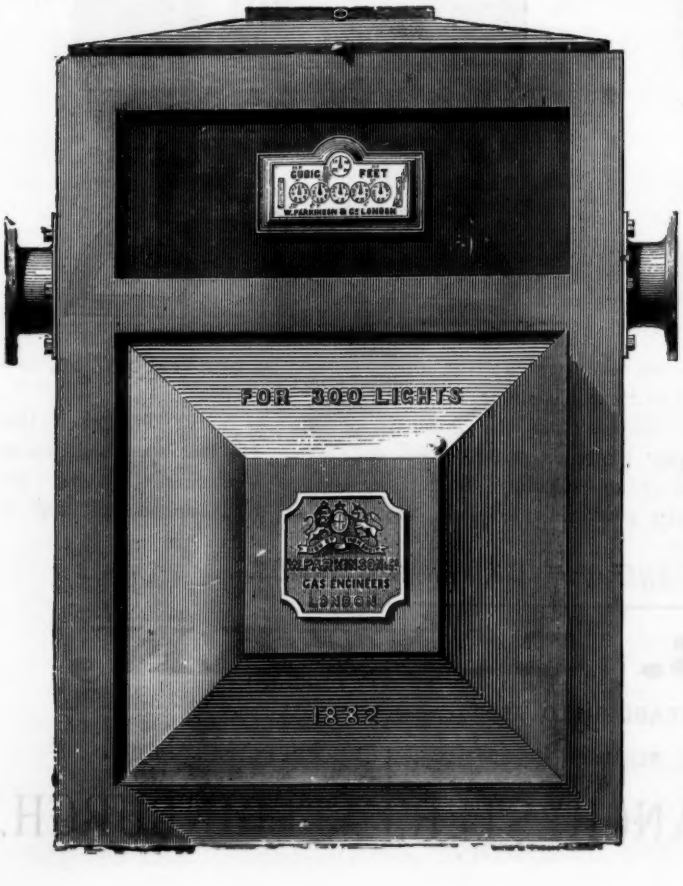

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CONTENTS.

EDITORIAL NOTES:—

GAS, LIGHTING, &c.— PAGE

The State of the Gas Industry at Home and Abroad . . . 839
Stock for South Metropolitan Gas Consumers . . . 840
The New Unionism a Failure in Australia . . . 840
Exhibition Prize Medals Discredited . . . 841

WATER AND SANITARY AFFAIRS—

The Report of the London Corporation Committee on the Water Supply of the Metropolis . . . 842

ESSAYS, COMMENTARIES, AND REVIEWS:—

Gas and Water Companies in the Stock Market . . . 843
Electric Lighting Memoranda . . . 843
An Absurdity Revived . . . 844

NOTES:—

The Illuminating Power of American Water Gas . . . 845
Lowering Cast-Iron Mains under Pressure . . . 845
Murdoch the Inventor of the Hollow Rock Drill . . . 845

TECHNICAL RECORD:—

The Energy of Solid, Liquid, and Gaseous Fuel . . . 845
Lighting, Heating, and Ventilation of Public Libraries and Reading Rooms . 846
Fuel Gas and some of its Applications . . . 848

REGISTER OF PATENTS:—

Separating Tar and Ammonia from Blast-Furnace and like Gases—Mackay, F. N. . . . 849
Preventing Gas Brackets moving on their Joints Self Actingly—Vickerman, W. . . . 849
Combined Steam and Gas Motor Engine—Haedicke, H. . . . 849
Treating Gases from Blast Furnaces, Gas Producers, and Coke Ovens—The Colmess Iron Company and Young, W. . . . 849
Gas Distributing Governor for Heating and Lighting Gas—Carnaby, S. . . . 850
Manufacture of Illuminating and Heating Gases—Wood, W. . . . 850
Regenerative Gas Lamps—Brown, A. O. . . . 850
Low-Pressure Water Meters—Parkinson, W. C. . . . 851
Patent Notices . . . 851

CORRESPONDENCE:—

Mr. Irving's Remarks at the Meeting of the South-West of England Association . . . 851
Electric Lighting at Hastings . . . 851
The Gas Workers' Union and its Executive . . . 851
Systems of Inclined Retorts . . . 851

MISCELLANEOUS:—

The Railway Companies and the Conveyance of Gas Coal . . . 852
The Heating and Lighting of London by Pipe-Lines . . . 853
The Edinburgh International Exhibition . . . 855
The Strike of Gas Stokers in Melbourne—Narrative by an Eye-Witness . . . 856
Leeds Gas-Works Management . . . 856
The Water-Gas Experiment at Harrogate . . . 857
The Dublin Corporation and the Gas Company—The Transfer of the Public Lighting Plant . . . 857
The Assessment of the Cambridge Gas Company's Property . . . 858
The Use of Gaseous Fuel for the Abolition of Smoke . . . 858
Gas and Electric Lighting in Berlin . . . 859
The Supply of Gas and Electric Light in Massachusetts . . . 859
The Water Inquiry by the Corporation of London—Close of the Sittings; The Committee's Report . . . 860
Coventry Corporation Water Supply—Proposed New Works . . . 861
Notes from Scotland . . . 861
Current Sales of Gas Products . . . 863
Gas and Water Companies' Stock and Share List . . . 864

PARAGRAPHS.—Imperial Continental Gas Association, 841—The Management of the Para Gas-Works, 841—Institution of Civil Engineers, 841—The Use of Gas-Stoves in the Metropolis, 841—Gas and Electric Lighting in Brussels, 842—Mr. Symons, 843—Portable Coal-Lifter for the Beckton Gas-Works, 843—Presentation to Mr. J. Mellor, 844—Increase in the Price of Gas at Boston, Lincs, 849—Water-Works for Duffield, 846—The Belgrano (Buenos Ayres) Gas Company, 854—Water Mains and Hydrants in the Metropolis, 854—Large Sale of Cardiff Gas Stock, 855—Launceston Water Supply, 855—Messrs. Crosby Lockwood and Son's New Works, 857—Belfast Water Commission, 859—The Seaborne Coal Supply of London, 859—Warwick Corporation Water Supply, 859—Stockton and Middlesbrough Water Board, 859—The Quality of the Chester Water Supply, 859—Ceara Gas Company, Limited, 861—Proposed Augmented Water Supply for Skipton, 861—Monte Video Water Works Company, Limited, 862—The London County Council and the Water Question, 862—Stroud Water Company, Limited, 862—The New Water Engineer at Bradford, 862—Serious Gas Explosion at Streatham, 863—Exhibition of Gas Fires at Maidstone, 863—Northern Coal Trade, 863—Conviction for Assaulting a Non-Unionist Stoker, 863—Interference with Sewers by Electric Lighting Companies, 863—Shrewsbury Corporation Water Supply, 863—The Dangers of Gas-Heated Baths, 863—Opening of the Livesey Public Library in Camberwell, 863—Conference on Suburban Water Supply, 863—New Water-Works for Denby, 864—Electric Light in Newcastle, 864—Fylde Water-Works Company, 864—The Recovery of Gas and Water Rates, 864—The Public Lighting of Lewes, 864—Long Eaton Water Supply, 864—The Gas Question at Mexborough, 864—Liability for Defective Water-Pipes, 864—The Central Co-operative Stores, 864—The Lancashire Coal Trade, 865—Gas Workers' Grievances at Belfast, 865—The Abolition of Gas-Meter Rents at Leigh, 865—The Water-Works Companies' Investment Trust, Limited, 865.

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THE

JOURNAL OF GAS LIGHTING,

WATER SUPPLY, & SANITARY IMPROVEMENT.

TUESDAY, OCTOBER 21, 1890.

The State of the Gas Industry at Home and Abroad.

IT is reported that the period of unnatural tranquillity which has prevailed in Paris in respect of gas affairs for the last year or two is coming to an end. The Municipality are moving once more against the Gas Company, upon the old pretence that they cannot understand why the price of gas should be so high. Another elaborate inquiry into the matter of the cost of gas making in Paris is threatened; but, of course, in the meantime the municipal money-box gapes as widely as ever for the subsidy from the Company. Readers of the JOURNAL who take an interest in this subject know very well how and why it is the gas consumers of Paris are made to pay so smartly for their supply. We regularly give the figures exhibiting the working of the Paris Gas Company; and it only requires a slight examination of these for any one year to show that if there had been a deliberate conspiracy between the most rapacious members of the financier class and the hollowest demagogues in the Municipality to victimize the Parisian gas consumer for their mutual advantage, they could not have devised an arrangement better adapted to their object than the concession under which the Paris Gas Company carry on their business. The whole system is so fundamentally and hopelessly wrong that no redress is possible. The gas consumer is bound hand and foot by the capitalists, who share their plunder with the Municipality; but this does not prevent individual members of the latter body from seeking from time to time a cheap, if fleeting, popularity, by posing as friends of the consumer, and in this capacity worrying the Gas Company with threats of legal process to compel a revision of the price of gas. It never results in anything, of course, because, under the terms of the Company's concession, they can only be compelled to reduce their price when it is proved, to the satisfaction of a Technical Commission, that the expenses of gas making are appreciably diminished in comparison with similar data for the era of the grant of the original concession, thirty-five years ago.

Certain of the gas consumers of Brussels are not happy, although the city gas-works are in the hands of one of the most democratic Municipalities on the Continent. Among others, the complaint of the Associated Café and Restaurant Proprietors is so curious as to deserve mention. These worthy burgesses have awoke to the fact that in the conduct of their ordinary business, which is carried on more in the open than is customary here, they burn a good deal of gas, which goes as truly to light the streets as the gas that is burnt in the ordinary public lamps. Consequently, they think that they ought to receive some consideration in the matter of the price they pay for their illuminant. It is an ingenious suggestion, not without a certain plausibility. It recalls the grounds of Mr. George Livesey's well-known objection to recognize any distinction between gas said to be used for a trade purpose because it happened to be burnt in a factory furnace, and the gas consumed by a publican or shopkeeper for the purpose of making his business premises attractive. He has always maintained that the one is as truly a trade purpose as the other, and has persistently declined to draw a line between them. This plea of the Belgian *restaurateurs* is a striking comment on the vexed question of what constitutes a trade use of gas.

There is always trouble and tribulation for the gas managers of the United States; but, according to reports which reach us, the Chicago Gas Trust have their hands unusually full just now. The proposed Exhibition, which is to be the biggest show on earth, before which Barnum himself must bow, is expected to do wonders for the city; and, among other things, it is anticipated that a good deal of illuminating gas will be required in the neighbourhood during the next two years, while the "Exposition," as Americans prefer to call it, is being got ready. Consequently, there are several energetic people who fail to understand why the existing suppliers of gas should have all the pickings on this occasion, and they are just now doing their utmost to prevent it. The Companies are accused of having forfeited their Charters on all sorts of grounds, and must therefore be swept off the face of the earth in satisfaction of outraged public morality. Then there has been trouble at Cincinnati, where General Hickenlooper controls the gas undertaking. An attempt has been made there to drive him off the field, or, at any rate, to get a footing alongside of him; but it is hardly necessary to say that the brave General is fully equal to the emergency. He is playing a very exciting game of King of the Castle; and, up to the present, no one has been able to dislodge him from his proud position. All sorts of tactics are employed for this purpose. At one time it is a Fuel Gas Company who humbly

plead for permission to lay mains in the city; but General Hickenlooper ruthlessly unmasks the pretenders—showing that there is no trade in fuel gas, and that mains once laid for this mythical commodity would soon be employed for distributiug illuminating gas. Nobody is deceived by all these pretences. American lawyers and speculators have a great knack for "making believe" when they are fighting one another. They scatter "tall talk" around with only too much freedom. Immortal principles are piled high in their pleadings for their own cause, and in their denunciations of swindlers on the other side; but the least attentive ear can detect the chink of dollars in their oratory.

A glance over the gas industry as carried on in other countries and under foreign conditions is thus found to show a few things in regard to which practitioners in England have reason to be thankful. British gas makers and consumers are to be congratulated on their escape from the paralyzing concession system, which, as applied upon the Continent, has had the effect of removing the gas industry from the healthy influence of the best commercial principles, and keeping it in a wholly artificial state of existence. We do not deny that the system referred to has been the means of conferring the benefits of gas lighting on many places which might otherwise have gone without it, or at least have had to wait many years longer for it; but in only too many instances the temporary assistance of the system has been dearly paid for afterwards by an industry in leading-strings, deprived of all natural development. In Paris, for example, millions have been paid for a mistake made thirty-five years ago, when the wise men who settled the terms of the Gas Company's concession failed to comprehend the true factors that operate in lowering the cost of gas making. A noteworthy observation on this subject was made at the recent meeting of the North of England Gas Managers' Association by Mr. William Hardie, of Newcastle-upon-Tyne. Mr. Hardie remarked that when he became Secretary of the Newcastle Gas Company, the price of gas coal was 4s. 6d. per ton; stokers were paid 23s. for seven twelve-hour shifts; and the price of gas was 4s. per 1000 cubic feet. Doubtless the Company could hardly pay their dividend at this rate. Now the Company pay 9s. per ton for coal; their stokers earn 40s. per week for eight-hour shifts; and the selling price of gas is 2s. per 1000 cubic feet. How is it done? The answer to this question would be a most valuable lesson to French and American statesmen, if they could only appreciate it. For the Frenchman, it may be pointed out that the possibility of cheap gas is shown by this Newcastle example to be a commercial rather than a technical question; and for the American it may be remarked that the Newcastle Gas Company have been able to sell gas at half-a-dollar per 1000 cubic feet because they have been allowed to attend to their proper business in peace and quietness.

Americans notoriously copy Frenchmen in many things; and it is curious how, although for a very different reason, French and American gas companies resemble one another in the inability to sell gas at a low price. The Frenchman is completely hide-bound by the concession system; the Yankee is the victim of that "little knowledge" which is such a dangerous thing in economical matters. Both American and French gas engineers are usually clever and wide-awake fellows; and the men who have money sunk in the gas supply of Europe and America do not require to learn in any school of finance and commerce. Yet the result is as we see it—that British gas companies can sell gas under similar technical and commercial conditions at about half the price that French or American companies can afford to ask. We do not argue that the British system is perfect; and it would be absurd to say that British gas manufacturers have not many and grave troubles of their own. But at least it may be contended that their difficulties are mainly natural ones, and are not aggravated by the legislative and constitutional mistakes that have forced some of their compeers in other countries to work under artificial and even irrational conditions.

Stock for South Metropolitan Gas Consumers.

The announcement that the Directors of the South Metropolitan Gas Company have arranged to give the consumers in their district the opportunity of becoming shareholders, by setting apart "C" stock for them to subscribe for in amounts of £5 and multiples thereof, at the uniform price of £242, has attracted some attention. The new departure is really a sequel of the profit-sharing scheme, and is intended to set in the strongest light the unity of all parties in a modern sliding-scale Gas Company. In a way, of course, the device is something like the fashion followed by certain gas consumers' companies of the past generation, which required consumers to take an interest in the concern proportionate to the amount of their rental. Likewise it has been arranged by some gas-supplying corporations that consumers and ratepayers should have the opportunity of acquiring small amounts of local stock. When all is said, however, the new South Metropolitan experiment possesses the charm of novelty, like so much else that has emanated from the progressive Company advised by Mr. George Livesey; and there will be considerable curiosity displayed in financial and gas circles as to its result. The Company will, of course, be quite safe in any event. The price is a fair one for the times. If the consumers respond to any great extent to the Directors' invitation, both parties will probably have cause for satisfaction. Some time must be allowed to elapse before the majority of the South Metropolitan consumers can be supposed to have thoroughly appreciated the Directors' offer, for novel official communications are very slow in reaching the average householder.

The New Unionism a Failure in Australia.

It must be with the heartiest satisfaction that everybody here, except the Opportunist Socialists, has received the news of the collapse of the Australian strike. This failure of the associated workers in Australia to establish the supremacy of Trades Unionism is really of the greatest moment in its bearing upon the fortunes of the New Unionism on this side. For the point upon which the Australian strikers have failed is precisely that upon which the New Unionists of this country would like to try their strength if they dared—extinction of freedom of contract in labour. Over and over again the Burnses, Tilletts, and the rest of them, have assured the community that although the time for the final battle for the principle of Trades Unionism had not come, it would not be long delayed. That absurd parody on a working man's newspaper, the *People's Press*, a week or two ago published an hysterical appeal to the "workers" to prepare for the "big fight ahead." But it becomes day by day more evident that the British workman will not "enthuse" to the striking-point while there is so much uncertainty about where his strike pay is to come from. One of the latter-day Socialists who has adopted Trades Unionism of the tyrannous sort as a convenient working hypothesis, is Mr. Champion, the whilom Editor of the *Labour Elector*, who has gone to Australia as an agent of the Burns Company. He has cabled to his head-quarters not to send any more money to Melbourne, as the strike has been mismanaged. There is wisdom in this, for the great principle of the Burns coterie is to sever connection betimes with a strike that fails; and the warning not to send more money to Melbourne is a clever way of getting out of the difficulty created by the fact that there is none to send. We may be sure that the Australian failure will put a stop to the unfurling of the banner of Unionism anywhere else. It has demonstrated the fact which had been almost lost sight of—that the day labourers of any community, although useful in their way, are not by any means so indispensable that they can control every other class. They have been told by the agitators who live upon them that they hold a position like that of the Pretorian Guards in the latter days of the Roman Empire; but Australia has shown them their mistake. A general strike doubtless inconveniences the upper and middle classes, and results in the loss of a great deal of money; but, after all, it is the strikers who suffer most from the suspension of business which they bring about. If the employers are compelled to close workshops and factories, they can bear the loss better than their workpeople; and, if need arise, the upper classes of a community can do a great deal for themselves which they usually pay others to do for them. Compelling the hated capitalist to wheel his own coals does not make matters better for the men who have usually earned wages at that employment. An object-lesson of this kind soon knocks the Socialistic veneer off the opinions of the Anglo-Saxon workman. Mr. Burns and Mr. Champion took to Trades Unionism because they found some difficulty in obtaining support from the

British workman while they only talked transcendental Socialism. They flatter themselves that they have succeeded in giving a Socialistic turn to the Unionism which they have been engaged in developing during the past year or two; but they deceive themselves. Men like Thorne, of the Gas Workers' Union, with whom these Socialists have been glad to mix for the sake of the air of reality which they carry with them into labour questions, are no more Socialists than they are Republicans, Home Rulers, or followers of any other cry of a general character. They may make use of the liveries of these parties, and perhaps occasionally lose their identity in the crowd that follows a popular leader; but while they remain anything at all, they are agitators for higher wages, shorter hours of work, or some other distinctly working man's cause. The British workman, whether at home or in Australia, cares nothing for Socialism except in so far as the use of the term may serve his purpose; and the Socialistic orators who think they are advancing their cause by the way of Trades Unionism are making a huge mistake. If they do not find this out, the workmen themselves will soon discover that Socialism is no road for them; and then Messrs. Burns and Co. will be driven back upon their old theories, with scant thanks for having masqueraded as friends of the working man.

Exhibition Prize Medals Discredited.

It is an ill wind that blows nobody any good; and we sincerely hope that the latest scandal about the prize medal awards in connection with the Edinburgh Exhibition will serve to put the finishing stroke to an already discredited system. The recipients of awards by the Edinburgh Jurors have been notified that if they desire to become actually possessed of the medals to which they are officially declared to be entitled, they will have to pay for them at a "reasonable price." A letter to *The Times* disclosing this system was published last week under the heading "The Canny Scot;" but while not protesting against such a comment upon the arrangement, it is hardly fair to allow it to be supposed that the device is a Scotch invention. We are unable to state with precision which was the first exhibition executive to conceive the brilliant idea of requiring exhibitors to pay for their medals; but it has often been done both at home and abroad. The invention does not strike one at the first glance as very creditable to those who make use of it; but this is doubtless because at the Great Exhibition of 1851, and some of its successors, the awards were managed otherwise. If the practice of expecting recipients of prize medals to pay for them had been adopted from the commencement of the age of exhibitions, it would doubtless have been regarded as a perfectly natural arrangement. As matters are, however, it looks bad all round. It would appear no worse if the conductors of exhibitions were to invite exhibits by engaging that awards would follow in proportion to the amount of floor space taken and paid for. Although this principle is, as a matter of fact, pretty closely followed in the management of exhibitions that offer prizes, we have never seen it openly avowed. It is time, however, that the thin veil that has hitherto been drawn over the methods of prize awards at these gate-money exhibitions should be dispensed with. Their value as a means of advertisement has been exhausted; and the weight of the tax which they put upon manufacturers is so generally understood, that nobody expects leading firms to be represented at every trumpery bazaar which labels itself an "International Exhibition." The prize-medal game is, in point of fact, played out; and advertisers must discover some other baits for custom. It is desirable to distinguish between the exhibition system and its excrescence—the prize medal. The former answers to a real want; the latter was an unfortunate blunder. Essentially, the modern industrial exhibition is the same thing as the old-fashioned fair, which brought together buyers and sellers at stated times. This arrangement is as convenient to-day as it ever was; and there is no reason why, if the corruption-breeding prize-medal system is abandoned, exhibitions should not continue to be held with success and credit. Only it is essential that the features of the fair, which has endured so long, should be followed, rather than those of the international exhibition, which has had such a chequered and brief career. That a reasonable amount of pleasure-seeking should be mixed up with the business of such gatherings is natural, and strictly according to immemorial usage. The proportions of the business and the pleasure will vary according to the locality and the occasion. The recent big show in Paris was mostly pleasure, as was, in a sense, befitting. What the Chicago affair—the only big thing of the kind now in view—is likely to turn out, nobody can say. These are exceptional undertakings. The most practicable and at the same time the most profitable exhibitions, from the business standpoint, will probably be those arranged by the authorities of specialized localities, or the representatives of associated trades. In these the idea will be to show typical collections of the arts and crafts of particular districts; and the character of the exhibits will constitute their sole reward.

Imperial Continental Gas Association.—At the half-yearly meeting of this Association, to be held on the 4th prox., the Directors will propose a dividend of 5 per cent. and a bonus of 1 per cent. for the six months ended June 30.

The Management of the Para Gas-Works.—We understand that Mr. J. Gibson Newbigging has been compelled, owing to ill-health, to temporarily relinquish the management of the Pará Gas-Works, and return to England. During his absence, his duties will be discharged by Mr. William Newbigging, who has just arrived home after completing his engagement as Manager of the Tokio (Japan) Gas-Works; and he leaves England for the purpose on the 4th prox.

Institution of Civil Engineers.—The Secretary of the Institution of Civil Engineers (Mr. J. Forrest) has issued, in accordance with the usual practice, a lists of subjects suggested by the Council for original communications to be presented in the forthcoming session, which will open on the 11th prox. Among them we notice the following, which refer to matters of special interest to our readers: The Design and Construction of Large Gas-holders; Mechanical Stoking in Gas-Works; Machinery for Shipping and Discharging Coal; The Design and Arrangement of Electric Supply Stations, and of Electric Distributing Apparatus for Domestic, Trade, and General Service in Towns, particularly as to Economy and Safety; The Comparative Advantages of Gas and Electricity for Lighting Purposes; The Cost of the Production and Distribution of Electrical Energy; The Distribution and Application of Electric Power in Towns; Lighting Railway Carriages by Oil, Gas, and Electricity; Subterranean Water in the Valley of the Thames, and its Relation to the Supply of London; Water-Meters, and the Sale of Water by Measure; Form and Construction of Masonry Dams for Reservoirs; The Utilization and Distribution of Water Power; Means and Appliances other than Sewers for Dealing with the Refuse of Towns; Manurial Value of Sewage Sludge, and the Best Mode of Applying it to the Land; Effect of Mixing Crude Sewage with Sea or Brackish Water; Liquid Fuel Motors and their Applications; Electrical Measuring Instruments; The Effect of Internal Stresses in Materials on their Powers of Endurance. Prefixed to the list is a statement of the various funds at the disposal of the Council for rewarding the authors of approved communications.

The Use of Gas-Stoves in the Metropolis.—The employment of gas as a fuel has developed in a remarkable degree in the Metropolis during the past two or three years; and this is due in no small extent to the efforts made by the Gas Companies to instruct their customers, by means of lectures delivered by ladies well-versed in the art of cooking, how to use gas to the best advantage and economically. Taking The Gaslight and Coke Company, we find that in the first half of the current year they sold 1514 stoves, and let out on hire 6369—together 7883. The total number of stoves sold by the Company up to June 30 last was 6236; and they had out on hire 23,467—making a grand total of 29,703. The private consumers in the Company's district number about 220,000. So that it will be seen that there is a vast field for further development; and this remark applies equally to the two other Companies supplying London with gas. In the case of the South Metropolitan Company, the number of cooking-stoves sold and let out on hire in the first half of this year was 2557; and the number of heating-stoves sold was 107—together 2664. The number of stoves on hire at June 30 was 12,693; and sold, 871—or a total of 13,564. In this Company's district, there are 72,648 consumers. With regard to the Commercial Gas Company, who have 20,960 consumers, they sold and let out on hire, in the six months ending June last, 263 cooking-stoves, and 166 heating-stoves—making together 429. The total number of stoves sold and out on hire up to June 30 last was 2759, of which 1467 were cooking, and 1292 heating stoves. These figures show that the aggregate number of stoves sent out by the Companies to their consumers in the half year was 10,976, and that the total number issued to June 30 was no less than 46,026. Of course, it is not possible to tell how many stoves are in use in the Metropolis which have been acquired direct from the makers or shopkeepers who deal in this class of goods. But it is computed by the South Metropolitan Company that there are about 2000 stoves in their district which have been purchased privately.

WATER AND SANITARY AFFAIRS.

THE County Purposes Committee of the Corporation of the City of London, directed in February last to inquire into the water supply of the Metropolis, held their thirteenth and final sitting in that capacity at the commencement of last week, under the presidency of Sir Guyer Hunter, M.P. No further evidence was forthcoming; and on Thursday the report of the Committee was presented to the Court of Common Council, when it was ordered to be taken into consideration at a future meeting. The report having been printed, was put into circulation at the close of the week, and naturally excited a considerable amount of attention. A summary of the document, embracing its leading features, will be found in another part of our columns to-day. The main conclusion of the Committee is "that the supply of water to the public should be in the "hands of a Public Authority; and no longer remain, as "it is at present, under the control of private Companies." The idea of an entirely new supply in place of that now furnished by the Companies, does not appear in the report. The scheme presented for approval is that the Corporation shall bring a Bill into Parliament for the creation of a "representative Water Authority," which shall acquire the undertakings of the Metropolitan Water Companies, the terms of purchase to be settled by arbitration. The report says that the technical form of the creation of this Authority "may perhaps be left to the par-"liamentary draftsman;" but the Committee think that a Commission issued by the Crown would be the most satisfactory mode. In the constitution of this body, there is to be a "representation of the areas," so as to provide an Authority capable not only of managing the supply, but also "governing the watershed" whence the supply has its source. It is this recognition of outside areas which materially affects the scheme of the Corporation Committee. There is something a little vague as to the "Commission," and the "Authority." It is difficult to determine whether these are one and the same, or whether they are distinct. But clearly, in some way or other, the water supply is to be in the hands of a Water Authority, composed of representatives from the various bodies governing the areas concerned. Not only so, but we read in one part of the report, concerning the watershed of the Thames above the intakes, that "the sanitary state of "this area should, in the opinion of your Committee, be "in the hands of the Water Authority which it is "suggested should be created."

The Corporation scheme, so far as its intention goes, is fatal at once to the ambitious egotism of the London County Council in aiming at the sole possession of the Metropolitan Water Supply. This was well foreshadowed the other day in the speech of Mr. A. W. Gadesden, the Chairman of the East London Company. Outside the boundaries of the Metropolis, and therefore beyond the jurisdiction of the London County Council, but within the statutory limits of the Metropolitan Water Companies, there are other County Councils, besides Municipal Corporations and Urban and Rural Sanitary Authorities. If we include the watershed of the Thames above the intakes, the authorities are still further multiplied. But, beyond all other considerations, it would be incongruous for the London County Council to be ruling over other County Councils in the matter of the local water supply. The Corporation of the City also has to be considered, and would certainly oppose any scheme for rendering it subservient to the County Council. One-eighth of the revenue of the Water Companies is said to come from the City area; and it is reasonably proposed that the City "should be ade-"quately represented on the Commission;" while at the same time the position of the London County Council is also to be "freely acknowledged and provided for." These two powers, therefore, are to be duly represented, together with sundry other bodies, specified as Municipal Corporations, County Councils, and Sanitary Authorities, over whose areas the Water Authority would have control. We observe that the *Daily News* very coolly remarks: "It is not likely "that Parliament will consent to create another body, as "the Committee propose; but that is a matter of detail." In the next sentence we read: "When the Bill is before "Parliament, it will be easy to modify it, so as to put "the water supply of London under the control of Lon-"don's governing body." According to the *Daily News*, London has but one authority. This is not so; yet, even if it were, other authorities would be found existing outside its grasp, covering 400 square miles of territory, and having a population largely exceeding a million, drawing their water supply from the London Companies. The notion that all these people are to pay tribute to the London County Council in the form of water-rates is by no means likely to be realized. The authorities of the outer areas have already begun to move; and from Essex there proceeds an emphatic protest against the Metropolitan Water Supply being handed over to the London County Council alone—a determination being expressed to "oppose any scheme which does not give "the Sub-Metropolitan districts full representation in pro-"portion to their population." Districts similarly situated in Middlesex, Herts, Surrey, and Kent are expected shortly to meet in conference on the same topic, and will doubtless arrive at a similar resolve.

All questions of an alternative supply are relegated by the Corporation Committee to the representative Water Authority of the future. The first thing is for the consumers "to become emancipated from the control of "private capitalists having vested interests; and for the "supply to be placed in the hands of a Public Authority." The evidence of Mr. S. Wood is cited, estimating the value of the ordinary capital of the London Water Companies at £27,726,473, and the value of the preference and loan capitals at £5,718,033. Taking the net profits of the Companies at £939,806 for the year, after providing for interest on preference and loan capitals, it is shown that if the requisite sum for the purchase of the undertakings can be borrowed at 3 per cent., the interest on the market value of the ordinary capital would amount to £831,794 per annum; leaving, therefore, a surplus of £108,012 available for a sinking fund, or for other purposes. Perhaps the County Council will find out what the Water Companies have to say to these figures. It will be observed that there is no allowance made for prospective profits, nor for compulsory sale. But, putting all that on one side, we do not quite see where or how the shareholders are to realize their present income of £940,000. It looks very much as if the so-called "surplus" was to be taken out of their pockets. At all events, the Water Authority would make a very good bargain—taking £9 for every £8. Last year the shareholders received 9·31 per cent. on £10,090,733. It is now proposed that they shall part with this for a sum of £27,726,473, on which their present yearly return of £939,806 would be equal to 3·39 per cent., while it is expected that the Water Authority will be able to raise the purchase-money at 3 per cent.—thus appropriating the difference. As for the County Council, there is a report that their Engineer (Mr. A. R. Binnie) recommends a change in the source of the supply; the water to be obtained from Wales. If the authorities cannot agree, and the Water Companies are also dissident, the settlement of the question will be a hard matter. The quinquennial assessment is the great lever which forces public opinion on the subject. If it could be seen that there would be no material rise in the charge for water, the present agitation would lose much of its force. There is no doubt that a very exaggerated view is taken of the assessment question as we have endeavoured to show when bringing it under review.

Gas and Electric Lighting in Brussels.—We learn from a communication lately received from a Brussels correspondent that in the Belgian capital, as in Paris, the price charged for gas, although the consumers are supplied at very different rates and under entirely different conditions, is giving rise to considerable agitation. In fact, this matter and the electric lighting question have been made the "platform" on which the forthcoming municipal elections are to be conducted. The Association of Coffee and Refreshment House Keepers of Brussels have lately presented to the Municipal Council a petition asking for a reduction in the price of gas, on the ground that not only are they themselves large consumers, but that they contribute to the lighting and general animation of a goodly number of streets. Delegates from the Association had an interview with the Chairman of the Gas Committee (M. Walravens), who advised them to send in their petition. This was rather a clever move on his part, inasmuch as several members of the Council who will go out of office intend to offer themselves for re-election; and they will necessarily have to support in the Chamber the demands of the petitioners, if they are desirous that their actions shall accord with the electioneering promises made at the meetings. The proposed scheme of electric lighting is another question which will soon have to be settled.

ESSAYS, COMMENTARIES, AND REVIEWS.

GAS AND WATER COMPANIES IN THE STOCK MARKET.

(For Stock and Share List, see p. 861.)

A WEEK of very bad weather in the latitude of Capel Court; but happily the worst of the storm is now over, and the financial atmosphere is looking clearer. If the next account can be got through fairly well, and if the Money Market does not get any tighter, a great improvement may be looked for. Prices all round have fallen so low that, in ordinary circumstances, the public might have been expected to step in and buy. But confidence has received a nasty shock; and until they can feel more sure that the bottom of the drop has been reached, they are mostly standing aloof. The Gas Market has not been very active, and movements are irregular. The interest is concentrated upon Gaslight "A," the quotation of which has been put up, although the prices of everything else, even of first-class securities, have been falling. On Saturday, one transaction was actually marked at 238¾; and the quotation is 235-239 (a rise of 2 in the week). We are unable to point to the cause of this advance. Meanwhile the 10 per cent. preferences have been put down to the extent of 4 for the "J," and 3 for the rest. No business, however, was done in them; nor indeed in any of the secured issues. But there was a single transaction in the "H" limited. South Metropolitans have been very quiet; a couple of deals in "B," and one in debenture stock at about middle figures, being all the business done. Commercials have only been saved from complete neglect by a parcel of old stock changing hands. The Suburban and Provincial Companies have been absolutely stagnant—without a single transaction in any one. The *ex div.* quotation of Alliance and Dublin, which had been allowed to stand unchanged from *cum div.*, has been lowered. Foreign undertakings have been variously affected. Imperial Continental seems scarcely so strong, though the quotation is no lower. The usual 5 per cent. dividend and 1 per cent. bonus will be paid for the past half year. Continental Unions £14 paid have been put up to the level of the fully-paid shares. San Paulo has been in request, and commands a good price. Buenos Ayres, however, is ½ easier. Bombay also has receded ¼. There has been more animation among the Water Companies; but the old prices remain unchanged.

The daily operations were: The Gas Market was decidedly quiet on Monday; and hardly anything was dealt in except Gaslight "A," the quotations of which advanced 1. At the same time "C," "D," and "E" fell 1; and "J," 2. Buenos Ayres was ½ lower. Business on Tuesday continued quiet; and beyond the lowering of Alliance and Dublin, the only change was a fall of ¼ in Bombay. On Wednesday, there were a few dealings in Gaslight "A," at hardening prices; but little else was touched, and quotations stood still. Thursday was rather more animated, and more stocks changed hands at fair prices. Continental Union £14 paid rose 1. Friday was quieter; and the only feature was a further fall of 2 in Gaslight 10 per cents, while "A" fetched top price. Saturday was more than usually active. Gaslight "A" was at its best—making a further advance of 1.

ELECTRIC LIGHTING MEMORANDA.

The Leeds County Council on Electric Lighting—Lewes Clamouring for Electricity—Electric Traction on Roads in the United States—A New Electricity Meter by Sir W. Thomson.

THE Leeds County Council are to be congratulated on their good sense in deciding not to meddle with public electric lighting on their own account. From the report which we published last week, it may be gathered that a strong effort has been made to induce the Leeds authorities to adopt a high-pressure alternating supply system; but the majority are evidently afraid to touch anything of the kind. The marvel is that anybody in the position of a custodian of public funds should take the responsibility of recommending the spending of money on the alternating high-pressure system, while the results of the Deptford experiment are so questionable. Surely, it might be thought that one venture of a quarter of a million sterling ought to be enough at a time. We notice that Mr. Alderman Spark told the Leeds public that electric lighting companies are making considerable profits. It is curious that this fact should have escaped us in our regular inspection of the conduct of the electric lighting enterprise in this country; and we should have been glad to give our readers the benefit of any precise information on this head if Alderman Spark had volunteered it. As the assertion was, however, unaccompanied by reference to names (to say nothing of figures) it must be taken for what it is worth. It may be noticed that the Electric Lighting Committee of the Leeds County Council managed to get a much fairer comparative estimate of the cost of gas and electric lighting by incandescent lamps than is usually met with. They stated that a 10-candle power incandescent lamp, which costs ½d. per hour, is equivalent to gas at 3s. 5d. per 1000 cubic feet. A very simple calculation will show that this is correct, assuming that a light of 10 candles can be obtained from a gas-burner consuming within a fraction of 3 cubic feet per hour. Where the comparison breaks down is in the major premiss—that a 10-candle incandescent electric lamp can be worked for the price quoted. Our own calculations tend to show that this estimate is too low by at least 33 per cent.

It looks very much as though the people of Lewes mean to make fools of themselves over their street lighting arrangements. A fortnight ago, as we reported at the time, a ratepayers' meeting was held in the town to consider various proposals for the street lighting, which included projects (1) for buying gas of the local gas company, (2) for making gas at works specially built for the purpose, (3) for water gas, and (4) for electric lighting. It thus appears that the local authority have fallen out with the gas company—which is not an unprecedented condition of affairs—and that certain local busybodies have done their utmost to commit their little town to some new fashion of street lighting—also a common enough experience. When a town is in this state, electricians and speculators in various lighting systems mark it for their prey. Occasionally one of them succeeds in obtaining an order from the local authority; and then a fresh chapter of experiences begins. Wonderful things are to be done by the new-comers; but, as time goes on, it is gradually discovered that the "new broom" is hardly all that fancy painted it before it was tried. Lewes has apparently decided to follow the lead of Leamington, Barnet, and Colchester, and abandon gas for electric lamps in the streets. It is to be hoped before the step is taken that will plunge the ratepayers into an unknown expenditure, the local authority will look into the matter a little more carefully than they have yet done, and ascertain how those towns have fared that have preceded them in the same path.

The Street Railway Association of the State of New York recently held a meeting at which the question of driving tramcars by electricity was discussed in remarkable fulness; representatives of the leading electric locomotive manufacturers being present for this purpose. The result of the discussion was not reassuring to those people who, for humanitarian or other reasons, hope for the day when electric shall supersede horse traction on both sides of the Atlantic. It transpired that nothing definite is yet known by the tramway managers of New York as to the comparative cost of working by electricity and horse power. When the electric tramway is allowed to take up all the street, and run its feed and return wires anyhow, regardless of everything else, it naturally does best; but where the effects of induction on telephone or telegraph wires have to be guarded against, the financial results are not quite so promising. The most significant feature of the discussion was the ignoring of storeage batteries as sources of power for self-contained cars. Nothing was talked of but driving from naked overhead wires, which of course are not to be thought of for European towns. Hence we fear that American experience with electrical street railways will not be available for advancing the solution of the problem in other parts of the world.

A fairly satisfactory electric meter that can be made at a reasonable cost, is still to seek. Sir William Thomson described a new machine of the class at the late British Association meeting; but it is not immediately apparent what useful purpose it can serve. The instrument is at once an indicator, by which the strength of current passing at any given moment may be read off on a scale, and a supply meter, by which the amount of current that has passed through the meter during any given time is recorded on an index. The recording gear requires the assistance of a clock to drive a cam at a uniform rate, which acts on a trailing wheel of the counting mechanism, and there is a device for causing this wheel to pass over a longer or shorter course according to the quantity of electricity passed through the coils of the meter. Of course, coming from such hands, the instrument is philosophically designed, and ingeniously constructed; but it seems to be altogether out of proportion to the work it ought to do. The consumer is supposed to wind up the driving gear periodically; and means are taken to ensure this being done, by making the instrument cut off its current if permitted to run down. What is to be the cost of a meter for measuring the supply to from one to twenty lamps is not stated; but, judging from the published description, it must be something considerable. It also looks as if the machine must be delicate in its adjustments, and decidedly bulky. If it works well, however, and is capable of introducing the much-needed element of measurement into the business of supplying electricity for lighting, a few drawbacks will be overlooked. Its chief rival in use will be the Edison electrolytic meter.

Mr. Symons, one of the collectors of the Commercial Gas Company, died last Tuesday, at the age of 78. He had held his appointment for about 20 years, and was much respected by all who khew him.

Portable Coal-Lifter for the Beckton Gas-Works.—The New Conveyor Company, Limited, have just designed a patent portable coal-lifter for the Beckton Gas-Works, where it will be erected in about two months from the present time. It is a machine of very novel and useful character; being, it is stated, capable of moving over any coal-yard, however extensive, and lifting heaps of coal into waggons or trollies without the assistance of hand labour. The summer storeage of coal at Beckton is about 300,000 tons; and we understand that the cost of conveying the coal into the retort-houses, under the existing system, is 8d. per ton. When the lifter is brought into use, this item of expenditure will, of course, be very materially reduced—in fact, will be brought down to a mere fraction.

AN ABSURDITY REVIVED.

It is, of course, understood by many people that the London County Council, as at present constituted, comprises a whole host of heaven-sent administrators, reformers, and what not. If this impression is not universal throughout the entire body of owners and occupiers of the Metropolitan area, it is not owing to want of advertisement by members of the Council and their outside supporters. We continually hear boasts to the effect that what the Council actually does with the limited means permitted to it by a jealous Government, is only an earnest of the things that will be done when the Council enters into its full inheritance of control of the police and of the rateable resources of the City and the rest of the province of London. Among other subjects to which the attention of this new administrative body is understood to be directed is the question of the abolition of London smoke. This is not quite such a pressing matter as several others which the Council has in hand; but it is nevertheless a serious question, and one that sooner or later must be looked into in a business-like manner. Perhaps by the time the Council has settled the water supply upon a generally satisfactory basis, procured acceptance of the principle of "betterment" in regard to street improvements, completed all necessary transriverian communications, and established the rule of innocuous amusements for the Metropolitan population, we may know enough of the smoke question to be prepared with a warrantable remedy which shall only require legislative sanction to perform its appointed office. At present, notwithstanding all the well-meant efforts of the Smoke Abatement Institution, it cannot be truly said that the smoke question is yet ripe for the intervention of either Parliament or the County Council. In saying this, we do not mean to convey the idea that smoke-prevention laws and the methods of their application in the Metropolis are all that could be desired. The fact is, of course, notoriously to the contrary. Smoke-prevention legislation is imperfect, and its execution is partial and unsatisfactory; and the Council would do a great deal of good if it could bring such legislation up to date, and ensure its strict application. Even if this were done, however, London would continue to be renowned for its manufacture of black fogs, which are the result of the outpourings of its innumerable house chimneys acting upon the cold mists arising from its river. While these agents for the production of black fogs remain untouched, the banishment from London of every factory, and the suppression of the smoke from every locomotive engine, river steamer, and industrial furnace, would leave the atmosphere of the Metropolis much the same as it is now. The smoke question in London is a question of the domestic fireplace; and until we are prepared to grapple with these in a fashion the tyranny of which could only be excused by reference to its efficacy, the smoke problem in its gravity must be pronounced insoluble.

Meanwhile, it must be conceded that no progress will be possible towards the attainment of the desired object without the fullest discussion of every contribution to the elucidation of the subject. It is for this reason that we publish in another column the gist of an "open letter" written by Mr. T. Howell Williams, F.C.S., a member of the London County Council, to Mr. Walter Wren, another member of the Council, on the heating and lighting of London by pipe-lines, with a view, as the writer says, to "the abolition of London smoke, and the future prevention of London fog." This is to be done, according to the author's notion, by making at the coal-fields two kinds of gas, for heating and lighting respectively, in conveying these gases to the Metropolis, and distributing them, which he thinks could be done at such a figure that it would be "impossible in the future to burn coal economically in London." The latter expression not being very clear, Mr. Williams obligingly repeats it with the explanation that he means it would not pay to import coal, so that in London pieces of the "precious, but uncleanly mineral" would only be tolerated as museum specimens. It will thus be noticed that Mr. Williams's programme does not fail in point of completeness. In making an end of London smoke, he means to make an end of its original and sustaining cause—the coal trade.

We do not give the first part of Mr. Williams's letter, which is devoted to the well-worn subject of the objectionableness of London smoke and fogs. All this may be taken for granted; and the repetition by Mr. Williams of the Londoner's case against fogs is pure waste of labour. Smoke-prevention enthusiasts are apt to lash themselves into a virtuous rage when declaiming against the evils of London smoke and the callousness of those who are apparently content to suffer from it. It has always appeared to us, however, that the attitude of passive endurance is really the only possible one under the circumstances, and that when people implore others to rebel against smoke or any other oppressor, it lies on them to show first that rebellion is hopeful as well as praiseworthy. This is the point where all smoke-prevention enthusiasts break down. They fail to persuade any sensible person that Londoners have, in respect to their fog trouble, any better course than to endure it. Perusal of Mr. Williams's counsels will show that he is no exception to the usual run of smoke-preventionists, whose perception of the evil is out of all proportion with their powers of suggesting a remedy. We need not repeat Mr. Williams's proposal; it is only necessary to take note of the way in which he supports it.

He begins by arguing that his plan cannot be unscientific or impossible because the late Sir W. Siemens once proposed to do something similar. Even Mr. Williams, however, rejects as absurd Sir W. Siemens's project for making coal gas actually in the pits; and he may therefore be open to conviction on the point that the scheme is not rendered more practicable even by the deprivation of this particular absurdity, and by assuming that the proper place for gas-works is at the pit's mouth instead of in the pit itself. For removing the retorts and furnaces, and the other paraphernalia of gas making, from the bowels of the earth to its surface, is merely avoiding certain very obvious disadvantages of construction and working. It entails sending the coal to bank, instead of carbonizing it at the bottom of the pit and sending up its products. The vertical distance to be travelled in this way by the coal or its products, however, is nothing to the horizontal distance which either must afterwards traverse before arriving at the point of consumption. Mr. Williams must therefore perceive that, leaving out for the moment all other considerations besides that of economy, it is simply a question whether it is better to carry raw coal or its products to the place where they will be converted into cash. At present we send the coal. It has to be proved that the other course would be more economical and otherwise preferable; and this is a task beyond Mr. Williams's powers.

The proposal is so exceedingly loose and vague that it is difficult to seize any particular argument advanced in its support, for the purpose of dealing with it critically. We suppose that the real question is the economical one; for Mr. Williams does not lay so much stress on the idea of the production of gas in or near London being a nuisance, as on the contention that if made on the coal-fields and sent to town thence, it would be so much cheaper that people would naturally leave off burning coal. This assertion, however, he does not attempt to prove in any way whatever. Moreover, after the first statement of his proposal, he says no more about the fuel gas which he imagines as being sent to London alongside the illuminating gas. This is rather a pity, for we should like to learn from Mr. Williams, as a chemist, what he means by fuel gas, and where it is to be had as an article of commerce. He alludes to it as though it were as common a commodity as petroleum. But it is hardly fair in him to leave his readers in this belief; and we therefore take the opportunity of stating that there is no such thing as "fuel gas," specially made from coal, in common use anywhere in the whole world.

Then, upon what grounds does Mr. Williams believe that the illuminating coal gas, which is a reality, could be made on any coal-field for half the cost of that actually sold in London? If he has any reason for making this astounding statement, he carefully conceals it. It is not quite clear whether he contemplates the summary extinction, without compensation, of all the Metropolitan and Suburban Gas Companies, so much of whose capital is represented by their works; but even the London County Council could hardly countenance this sort of thing, although it were proved that brand-new works at the coal-fields and high-pressure mains from there to London, would put gas into the town at something like one-half the current prices. Upon the wildest assumptions, however, this could not be proved to the satisfaction of anybody prepared to take due account of everything. In the first place, Mr. Williams is himself uncertain with regard to the location of the coal-fields of which he speaks so glibly. He thinks that North or South Staffordshire or South Wales would do as the site for the gas-works that should supply London; but he is happily oblivious of the considerations that might be held to militate against making the gas and fuel supply of the capital dependent upon one or two pipes considerably over a hundred miles long, and on the output of one or two pits in a certain coal-field. He does not think of the cost of sending residuals to market, the difficulty of settling a colony of workmen, or, in short, of anything at all that a cautious person would have pondered over before launching such a preposterous scheme as this at the heads of members of the London County Council. When Sir W. Siemens first prattled about the idea before the British Association, it was as much as could be endured by those who wished to retain some respect for the speaker's name and the company to which his idle words were addressed. What Sir W. Siemens could do without being laughed at too openly, people in the position of Mr. Howell Williams, F.C.S., &c., cannot afford to copy. Eminent personages are permitted to talk nonsense occasionally; but this is a luxury not to be enjoyed with impunity by anybody under the grade of F.R.S. We always follow with care fresh contributions to the literature of the smoke question, because we recognize that the ultimate solution of this problem will be a matter of gas supply. But it is much to be regretted when a serious subject, as this of smoke abatement really is, is turned into ridicule by such crude guessers at the elucidation of the questions involved in it as we must conclude Mr. Williams to be from the evidence of his own words.

Presentation to Mr. J. Mellor.—Mr. James Mellor, of the Rochdale Gas-Works, has lately been presented by his fellow-workmen with a handsome timepiece and cruet, accompanied by an expression of their best wishes for his future welfare, on the occasion of his marriage.

NOTES.

The Illuminating Power of American Water Gas.

According to a statement published by *Progressive Age*, the gas supplied to Pensacola, Florida, which is of 35-candle power, is as high in illuminating value as any gas manufactured on a large scale in the United States. Pure resin and petroleum gases of higher luminosity are supplied to only a few small cities and towns. Of the larger cities of the States, New Orleans has the richest gas; the standard illuminating power being 33 candles. As at Pensacola, this gas is a mixture of oil and water gases made and measured separately; and in both places the consumers' meters indicate the value of the gas passed in dollars and cents instead of the quantity. Next to New Orleans for the illuminating power of its gas ranks the city of New York. The gas here is produced by a modified Tessié du Motay process; the water gas being made separately, carburetted with oil vapour, and passed through hot retorts to be fixed. Evidently there is not the same command over the quality of the product thus made as there is when the carrying and illuminating gases are generated separately and mixed in any desired proportions. Outside the cities mentioned, the gas of highest illuminating power is the water gas made by producer and cupola systems. These have the same limitations as the Tessié du Motay system; but they are all capable of producing gas of a higher illuminating power than can be satisfactorily used for general illuminating purposes. Alike in the Tessié du Motay and in the cupola processes, the quality of the gas at the outlet of the generators varies from minute to minute, which is commonly cited as an objection to water gas processes. The variation disappears, however, at the outlet of the relief holder; and even where there is no such holder, the mixing that takes place in the purifying apparatus is sufficient to obliterate all differences of quality. The intelligence displayed in the management being the same, it is contended that there need be no greater variations in the quality of water gas than in coal gas. Short runs seem to be the accepted cure for these variations in the quality of water-gas production. It is admitted that with 20 or 30 minute runs, many water-gas plants made as much tar and lampblack as gas.

Lowering Cast-Iron Mains Under Pressure.

Mr. W. L. Cameron, the Superintendent of the Artesian Well Company of Memphis, Tennessee, writes to the *Engineering and Building Record* with reference to the lowering of water-pipes, &c., without interrupting the service. He declares that elaborate plans for performing operations of this kind are not necessary, and states that he has successfully lowered some 1000 feet of 12-inch pipe through a depth of from 2½ to 4 feet, by simply undermining the pipe with a trench of the necessary depth, cut a little wider on one side to prevent jamming of the joints. Under and slightly behind every socket a support of earth a foot wide was left until everything was ready for the lowering, when these banks were cut away an inch or so at a time, and the pipe allowed to settle. A caulker or two were on hand to look after the joints as the line of pipe sank. All the fire-hydrant branches went down in the same way; and the pressure on the pipe, which was from 50 to 60 lbs., was never taken off. No blocking or rods were used; but if the trench had been in rock, jacks could have been placed under every second or third joint of the pipe, and the rest carried on proper wood backing. In this way some 300 feet of 24-inch suction-pipe was lowered while a 6 million gallon pump was drawing its supply through it; and the engine never felt any air leaks during the progress of the work. Although nothing is said on the point, the joints of these pipes were probably made with lead and yarn in the ordinary way; and the result is a striking testimony to the adaptability of this method of jointing.

Murdoch the Inventor of the Hollow Rock Drill.

It appears that among the other claims of William Murdoch to the respect of engineers all over the world, and of his countrymen in particular, must be included that of the invention of a hollow drill for the perforation of stone, which in its most improved form (as the diamond drill) is one of the most valuable aids to modern engineering. This subject was dealt with at a recent meeting of the American Institute of Mining Engineers by Mr. W. F. Durfee, of Birdsboro', Pennsylvania, who, while admitting that the diamond drill was first employed by Professor Rudolph Leschot, a French engineer, in 1862, stated that the idea of drilling a hole in stone by means of a rotating hollow tool was conceived by Murdoch at the beginning of the century. Murdoch's object in this invention was the manufacture of stone pipes for the conveyance of water; and his drill was a thin hollow cylinder of sheet iron, to which was given an alternating rotary motion—the lower or cutting end of the cylinder being copiously supplied with sand and water. This drill was, therefore, the direct outcome of the common stone saw. Stone pipes made in this way were sold in the early part of the century; and it is a matter of record that the pipes for the first water supply of Manchester were produced by this process. According to information supplied by Mr. T. H. G. Berry, the Superintendent of the Manchester Corporation Water-Works, the old Manchester and Salford Water-Works Company laid down stone service-pipes in the streets in the period from 1810 to 1814. These pipes were bored out of a soft, oolitic limestone, procured from a quarry in the West of England, and were cut into 2 feet lengths, with spigot and socket joints made with Roman cement. The bore of these pipes was from 3 to 18 inches. The price paid for 3-inch pipes was 4s. 11d. per yard; for 4-inch, 7s. 8d. per yard; for 6-inch, 11s. 6d. per yard; and so on up to 18-inch, which cost 45s. per yard. These pipes would not stand much pressure, however; and their use was discontinued in favour of cast iron, except in the higher parts of the city, where the pressure was low. Pieces of the pipe are still preserved in Manchester.

TECHNICAL RECORD.

THE ENERGY OF SOLID, LIQUID, AND GASEOUS FUEL.

At a recent Meeting of the American Institute of Mining Engineers, a paper on the above subject was read by Mr. W. J. Taylor, of Philadelphia, from which we make the following extracts:—

Nature has furnished us with fuel in three forms—viz., solid, liquid, and gaseous. Solid is the most common; liquid contains the most energy; and gaseous is the most convenient. Hence the tendency of the day is to the conversion from the solid and liquid to the gaseous form. There is magic in the word "gas" to the large majority of people, who, through ignorance or indifference, imagine that an immense amount of energy can be added to all solid or liquid fuel if it is only converted into gas first; forgetful of the fact that one of the laws of Nature is that the conversion of any substance from one form to another involves a loss of energy. It therefore follows that, if we get more duty out of the gas resulting from a given amount of coal than we can obtain from the coal itself used direct, it is not because we have added energy in the conversion, but because we can utilize in a gaseous form a larger percentage of the total energy than we can in the solid.

The cheapest gas per unit of heat that we can make is what is commonly known as producer gas, which might be termed air gas, as the oxygen for oxidizing the carbon to carbonic oxide is derived mainly from air, while the nitrogen which accompanies it is liberated; thus making it the weakest of all useful gases—that is, lowest in combustible, both by weight and volume. Next to this is water gas, in which the oxygen for combining with the carbon is derived from water vapour, while hydrogen is liberated; and this gas carries more than double the energy of producer gas. Then we have coal gas, which is the ordinary illuminating gas distilled from bituminous coal, carrying more than double the energy of water gas. Last, but not least, comes natural gas, made in Nature's producer, which we cannot duplicate in practice by any process known at the present day. This is again but 50 per cent. stronger than coal gas. The introduction of natural gas for metallurgical uses has largely stimulated the production and use of artificial gas made from coal and also from oil, if the vapours of the latter can be considered a gas.

In dealing with gaseous fuel, the first thing to be considered is what percentage of the energy of the fuel converted is delivered with the gas. Producer gas, while the lowest in energy, can be made more cheaply per unit of heat than any other. Yet in the original Siemens producer and regenerative furnace, practically all the heat of primary combustion—that is, burning the solid carbon to carbonic oxide—was lost, as little or no steam was used in the producer, and all the sensible heat of the gas was dissipated in its passage from the producer to the furnace, which was usually at a considerable distance. The former alone represents, as near as may be, a loss of 30 per cent. of the energy of the solid carbon in the coal. More modern practice has improved on this in two ways—first, by introducing steam in the air blown into the producer; and, secondly, by utilizing the sensible heat of the gas in the combustion furnace. In practice we recover a considerable percentage of the heat of primary combustion by the use of both the means stated. In this way, theoretically, about 60 per cent. of the energy of carbon converted into carbonic oxide should be recovered; for we should readily oxidize 1 lb. of carbon out of every 4 lbs. with oxygen from water vapour.

We will now deal with the gasification of anthracite coal. In this coal, the volatile combustible, whatever it may be, varies from 1½ to upwards of 7 per cent.; and while the flame from it resembles that of hydrogen, the amount of marsh gas found in anthracite producer gas corresponds, as near as may be, with the total volatile hydrocarbons in the coal. If this is correct, all the hydrogen is derived from the dissociation of the water vapour. We almost invariably find 1½ per cent. or more of marsh gas in anthracite gas from coal containing (say) 5 per cent. of volatile combustible (volatile hydrocarbons), which is about what it should be if all the volatile combustible in the coal is marsh gas. If it is not, where does the marsh gas in the gas come from, and how can we account for the excess of hydrogen? If the carbonic acid were high, and the resulting additional heat expended in an increased dissociation of water, it would account for it; but with low carbonic acid and all the volatile combustible represented by the marsh gas, together with the assumption that we cannot gasify more than one-fourth of the carbon with water, it is difficult to account for all the

hydrogen found in the gas. If we knew that we had nothing but solid carbon and marsh gas to deal with in anthracite, it would be easy to calculate, from an analysis of producer gas, the amount of energy we were deriving from the coal. But I think it will be safe to assume that we can deliver at least 85 per cent. of the energy contained in anthracite.

I will next consider bituminous coal for making producer gas. Comparing an average analysis of Siemens producer gas (European practice) with American anthracite gas and gas from soft coal containing 55 per cent. of carbon and 33 per cent. of volatile combustible, we have the following results:—

	Siemens Gas.	Anthracite Gas.	Soft Coal Gas.
CO	23·7	27·0	27·0
H	8·0	12·0	12·0
CH_4	2·2	1·2	2·5
CO_2	4·1	2·1	2·0
N	62·0	57·3	56·5
	100·0	100·0	100·0

So that the latter gas made from coal containing (say) six times the volatile combustible contained in the anthracite, did not average more than 50 to 75 per cent. more marsh gas than the gas from anthracite. This showed that something was wrong; and I soon came to the conclusion that the discrepancy arose from the fact that, while the volatile combustible in antharcite was all a fixed gas when volatilized, this was not the case with bituminous coal, and that only a small part of the volatile combustible in the latter was fixed in volatilization, while only what was fixed was represented in an analysis. This shows that all the hydrocarbon vapour was condensed in the sample cooled down to 60° for analysis; but in the passage of the gas to the furnace not enough heat was lost to condense much, if any, of it. Hence it was utilized in the furnace and effectually, too, while none of it was shown in the analysis.

Anthracite gas burns with a sharp blue non-luminous flame; while bituminous coal gas is very luminous, and radiates much more heat. A theoretical analysis will show at once not only how much more of the energy of the coal it carries, but how much more energy the gas itself carries both by weight and volume, besides the advantage of luminosity derived from hydrocarbons, which is now generally conceded, particularly at high temperatures. The quality of the heating that has been done with anthracite gas is very good—the energy of the bituminous gas taken being 3484 heat-units per pound, against 2246 heat-units for anthracite. Of course, a large majority of bituminous coals are much lower in volatile combustible and higher in carbon. Probably a fair average would be 70 per cent. carbon and 20 per cent. hydrocarbon, with 10 per cent. ash.

There is much more literature at our command on the subject of water gas than on producer gas. It is made, as is well known in an intermittent process by blowing up the fuel bed of the producer to a high state of incandescence (and in some cases utilizing the resulting gas, which is a lean producer gas), then shutting off the air and forcing steam through the fuel, which dissociates the water into its elements of oxygen and hydrogen—the former combining with the carbon of the coal, and the latter being liberated. This gas can never play a very important part in the industrial field, owing to the large loss of energy entailed in its production; yet there are places and special purposes where it is desirable, even at a greatly excessive cost per unit of heat over producer gas—for instance, in small high-temperature furnaces, where much regeneration is impracticable, or where the "blow-up" gas can be used for other purposes instead of being wasted. Some steel melting has been done in Europe with this gas, under the claim that much more work can be got out of a furnace in a given time, owing to the greater energy of the gas; so that the extra cost is more than balanced. I doubt this, because of the lack of luminosity (hydrocarbon flame), unless some oil is introduced into the furnace.

I will now consider the reactions and energy required in the theoretical production of 1000 cubic feet of water gas which is composed, theoretically, of equal volumes of carbonic oxide and hydrogen. The weight of 500 cubic feet of hydrogen is 2·63 lbs.; and that of 500 cubic feet of carbonic oxide, 36·89 lbs.—total, 39·52 lbs. Now, as carbonic oxide is composed of 12 parts of carbon to 16 parts of oxygen, the weight of carbon in 36·89 lbs. is 15·81 lbs. and oxygen 21·08 lbs. When this oxygen is derived from water, it liberates, as above, 2·63 lbs. of hydrogen. The heat developed and absorbed in these reactions (roughly, as we will not take into account the energy required to raise the coal from the temperature of the atmosphere to 1800°) is as follows: 2·635 lbs. of hydrogen absorb, in dissociation, from water (2·635 × 62,000) 163,370 heat-units; while 15·81 lbs. of carbon burned to carbonic oxide develop (15·81 × 4400) 69,564 heat-units—being 23,806 heat-units excess of absorption over development. The loss due to this absorption must be made up in some way or other. Now, if this could be added from carbon burnt to carbonic acid without loss by radiation, we would only have to burn an additional 6·71 lbs. of carbon to give this supporting heat; and we could then make 1000 cubic feet of water gas from 2231 lbs. of carbon, or 26·2 lbs. of 85 per cent. coal. This would be the perfection of gas making, as the gas would contain really the same energy as the coal. But instead, we require in practice more than double this amount of coal, and we do not deliver more than 50 per cent. of the energy of the fuel in the gas, owing to the supporting heat being obtained in an indirect way, and with imperfect combustion. Besides this, it is not often that the total carbonic oxide and hydrogen exceeds 90 per cent; the balance being carbonic acid and nitrogen. But water gas should be made with much less loss of energy by burning the "blow-up" (producer) gas in brick regenerators, the stored-up heat of which can be returned to the producer by the air used in blowing up. I think too little attention has been given to returning lost heat by the air, and too much to superheating steam; but between these two sources, much lost heat can be returned to the producer, resulting in far less loss of energy.

Let us now consider the part that petroleum can play as fuel. The average yearly production of petroleum for the past ten years in America was (say) 24,165,920 barrels, equal to 3,310,400 tons, against 150,000,000 tons of coal mined in 1889. Now, as the energy of oil is practically 50 per cent. more than coal, if all the oil taken from the ground last year had been used for fuel, it would have displaced on this basis 4,965,000 tons of coal only. But assuming that oil could deliver in practice double the energy of coal, it could then only displace 6,620,800 tons; and we should still require 143,379,200 tons of coal for heating. So that oil cannot play an important part in supplying our heat requirements. The natural gas used in 1889, it is estimated, contained energy equivalent to from 12,000,000 to 15,000,000 tons of coal, or more than twice the energy of the oil production of the country for the same time. But, as before stated, oil contains so much more energy, both by weight and volume, than any other available fuel, that it is a valuable heating agent in some special and high temperature furnaces. Common crude petroleum is composed of about 84 parts of carbon and 14 parts of hydrogen; the remainder being earthy matter. Hence, the energy per pound is approximately a trifle less than 50 per cent. more than 1 lb. of good coal, which, owing to the hydrocarbons in it, usually carries the energy up to what it would be if it were pure carbon, and in some cases more. The best evaporation with oil in practice has never exceeded coal by more than about 50 per cent.

Having considered the energy contained in different kinds of fuel, the author proceeded to deal with its utilization; taking for a basis its evaporative power under a good boiler. The result of two investigations on this point was that boilers could not well be fired with anthracite gas, but that producer gas could be usefully employed for the purpose.

Towards the close of his paper, Mr. Taylor referred to gas-engines. He remarked that the improvements which have been made in these engines and their adaptation to producer gas, were rapidly developing the importance of a more direct use of fuel energy; and the power developed with producer gas in this way in the past few years in Europe was a forcible illustration of what could be done. It was quite common practice to obtain 1-horse power from 1¼ lbs. of coal; and there was no doubt that this would shortly be reduced to less than 1 lb. by the introduction of improvements in both producer and engine practice. The importance of this system of power, its economies and advantages where a constant force was required, would be far reaching—especially in electric lighting, pumping water, &c., as the best type of a triple-expansion engine, with its high cost and complications, coupled with the best boiler practice, could not go below (say) 1½ lbs. of coal per horse power.

For convenience of reference, the author gave at the end of his paper the following table, showing what might be considered average analyses by volume, with the weight and energy per 1000 cubic feet, of the four types of gases used for heating and illuminating purposes:—

	Natural Gas.	Coal Gas.	Water Gas.	Anthracite Gas.	Bituminous Gas.
CO	0·50	6·0	45·0	27·0	27·0
H	2·18	46.0	45·0	12·0	12·0
H_4	92·60	40·0	2·0	1·2	2·5
C_2H_4	0·31	4·0	..	..	0·4
CO_2	0·26	0·5	4·0	2·5	2·5
N	3·61	1·5	2·0	57·0	56·2
O	0·34	0·5	0·5	0·3	0·3
Vapour	..	1·5	1·5	..	..
Weight of 1000 c. ft. (lbs)	45·60	32·0	45·6	65·6	65·9
Heat-units in 1000 c.ft.	1,130,000	735,000	322,000	137,454	156,917

THE LIGHTING, HEATING, AND VENTILATION OF PUBLIC LIBRARIES AND READING-ROOMS.

(*Concluded from p.* 801.)

The following tables, given by Professor Vivian B. Lewes in his lecture before the Royal Institute of British Architects,* further illustrate the advantages of the regenerative ventilating gas-lamp, as compared with other gas-burners.

Illuminating Power per Cubic Foot of Gas consumed, and Products of Combustion per Candle Power.

Burner.	Candles.	Carbonic Acid. Cub. Ft.	Water Vapour. Cub. Ft.
Batswing	2·9	0·18	0·46
Sugg's "London" Argand	3·3	0·16	0·40
Welsbach (incandescent)	6·0	0·09	0·22
Wenham (regenerative)	10·0	0·05	0·13

This table shows that the regenerative lamp not only gives a

* See JOURNAL, Vol. LI., p. 687.

higher illuminating power per cubic foot of gas consumed than other burners, but that also by its use a much smaller proportion of carbonic acid and water vapour is produced per candle power.

TABLE *showing the Quantity of Gas consumed, Oxygen removed from the Air, and Carbonic Acid Gas and Water Vapour generated, to give an Illumination equal to 32-Candle Power.*

Burner.	Gas burned. Cub. ft.	Oxygen removed. Cub. ft.	Water Vapour. Cub. ft.	Carbonic Acid. Cub. ft.	Equal to Adults.
Batswing	11·0	13·06	14·72	5·76	9·6
Sugg's Argand.	9·7	11·52	12·80	5·12	8·5
Welsbach	5·3	6·30	7·10	2·75	4·6
Wenham	3·2	3·68	4·16	1·60	2·6

This table shows the small proportion of oxygen removed from the air by the use of the regenerative lamp, as compared with the quantity destroyed when other gas-burners are used.

All these data point to the fact that, of the various methods in use for lighting libraries by means of coal gas, the regenerative form of lamp is not only the best, but also the most economical in the consumption of gas.

The voltaic arc light, as well as the incandescent electric light, is, of course, produced by intense incandescent heat. According to Dewar, the temperature between the two carbon points of the arc light is 6000° C.; while Rosetti gives the positive carbon 3200° C., and the negative carbon 2500° C. The temperature of Swan's filament of the incandescent lamp is stated by Dewar to register 1900° C. Yet, notwithstanding these high rates of temperature, a very small proportion of heat is radiated from the electric light as compared with that radiated from gas light. Dr. Julius Maier states that to produce an equal amount of light, coal gas gives off about 100 times more heat than does the electric arc lamp; and that in the process of combustion 94 per cent. of ordinary gas is transmuted into heat, while only 6 per cent. is available for the production of light. But General Morin, another authority on the subject, says that a gas-burner, consuming 5 cubic feet of gas per hour, gives off 48½ heat units per minute, or 2·910 per hour; that electric glow lamps yield 1-5th to 1-10th, and the voltaic arc light 1-20th to 1-50th of the heat given off by gas-jets producing an equivalent amount of light.

Dr. F. Fischer is responsible for the following statistics, showing the amount of heat and carbonic acid produced by different forms of light, with a standing illuminating power of 100 candles:—

Form of Light.	Units of Heat.	Carbonic Acid in Cubic Metres.
Electric arc light	57 to 158	0*
Electric glow light	290 to 536	0
Siemens gas-lamp	1,500	0†
Argand gas-burner	4,860	0·46
Ordinary gas-burner	12,150	1·14

* With some carbons, acid is given off.
† The gases produced are carried directly away.

With a view of ascertaining the difference in temperature of a room lighted with gas by ordinary burners, as compared with the temperature when the electric light is in operation, experiments were made in the news-room of the Public Library at Reading under the two systems of lighting. The gas-burners in use were Sugg's ordinary governors—the gas burning openly in the air, and giving an illumination equal to about 360 candles; while the two electric arc lights in the room gave a total of some 2400-candle power. The dimensions of the room are 18 feet high, 27 feet long, and 31 feet wide. The conditions of ventilation were the same on both occasions, and the following table gives the results:—

Time of Lighting.	Method of Lighting.	Temp. Fahr. in Open Air Outside Building.	Temp. Fahr. in News-Room. 5 Feet from Floor.	Temp. Fahr. in News-Room. 16 Feet from Floor.
1 p.m.*	Gas light	65·0	65·5	65·0
	Arc light	63·5	64·5	65·0
7 p.m.†	Gas light	61·5	66·0	66·0
	Arc light	63·0	66·0	66·0
10 p.m.‡	Gas light	61·5	70·0	81·0
	Arc light	60·5	65·0	66·0

* Midday; no lamps lighted. † Evening, before the lamps were lighted. ‡ After lamps had been lighted three hours.

By these figures it will be seen that, after the gas had been burning three hours, the thermometer at 5 feet from the floor had risen 4°, and at 16 feet from the floor it had risen 15°, although the temperature outside in the open air had not changed. When the arc lamps were in operation, and after they had been lighted three hours, the thermometer at 5 feet from the floor registered a fall of 1°, and showed no change at 16 feet from the floor, but the outside thermometer had fallen 2·5°.

These illustrations of temperature show that, with gas in use by the usual method of consumption, the purest and coolest air is to be found in the lower part of the room, and that the most impure and hottest air is nearer the ceiling. The hot air (which is, of course, highly charged with impurities injurious to health) slowly cools if not immediately carried away; and as it cools, becoming heavier than the normal air below, it descends, mixes with the purer air of respiration, and vitiates it.

The effect of artificial light upon the eyes is of no little importance, especially when we consider that reading is, perhaps, the most severe strain to which the eye is usually put; and the additional fact that the letterpress of many of the journals in the rooms of our public libraries is anything but clear, points to the value of the artificial light supplied being as good in quality as can be provided. On this subject we are able to obtain some interesting details with respect to the colour-rays produced by various kinds of light. When coal gas is the illuminant, the eye not only receives the heat-rays, but also a preponderance of the red, orange, and yellow rays; and with the incandescent electric lamp the same colour-rays also prevail. But in using the electric arc light, the predominating rays of colour are blue, violet, and indigo. Dr. Alfred Ritter von Urbanitzky states (*vide* "Electricity in the Service of Man") that experiments have shown gas light to be stronger in red rays than either sunlight or electric light; but that the arc light is richer in violet rays than either sunlight or gaslight.

Now, the effect of different colour-rays upon the retina of the eye, and upon the human system, is of more consequence than is usually supposed. Dr. E. D. Babbitt, who has spent many years in the study of the matter, says, in his work already mentioned, that the electrical colours—violet, indigo, and blue—are cooling and soothing to the nerves and blood, white, yellow, and orange are animating to the nerves, but red and the invisible heat rays are exciting to the blood. Dr. Forbes Winslow also remarks in the same work that, according to a distinguished oculist, light is injurious to the eyes in proportion as the red and yellow rays prevail, as they produce cerebral and visual excitement, followed by debility of the retina of the eye.

On this point of the analysis of lights, valuable evidence is given by Professor Tyndall, respecting the three forms of light in the following figures:—

	Visible (or Light) Rays.		Invisible (or Heat and Chemical) Rays.
Gas	gives 1	to	24
Incandescent wire	„ 1	„	23
The arc light	„ 1	„	9

Thus showing what small proportion the visible rays of gas and incandescent lights bear to the invisible, as compared with the arc light.

Sir Henry Englefield proved by experiments how the heat increases as we go from the electrical to the lower thermal colours. In his experiments, the thermometer rose in the different rays as follows:—

		Deg.		Deg.		Deg.
In the blue rays in 3 minutes, from		55	to	56	or	1
„ green	„ „	54	„	58	„	4
„ yellow	„ „	56	„	62	„	6
„ red	2½ „	56	„	72	„	16
Below the red	„ „	61	„	79	„	18

Demonstrating the fact that there is 18 times as much heat effect produced by the trans-red ray in 2½ minutes as from the blue ray in 3 minutes. The violet ray—another of the electrical colours—is considered to produce still less heat effect than the blue.

A great deal has recently been said respecting the accidents which have occurred in America, and which have been brought about by electric currents. Inquiry, however, appears to have shown that these accidents have generally been due to the rough and imperfect manner in which overhead wires have been insulated. In this country, the provisions of the Board of Trade are such as tend to guard the public from these mishaps. Electric lighting is not, indeed, so dangerous as is often supposed, provided the installation is thoroughly carried out. Competent experts, including fire insurance companies, agree that, with proper precautions, the electric light is a much less dangerous illuminant than gas, oil, or candles. The principal advantage of the electric light, as compared with gas light produced by ordinary burners, is, in the words of Professor Tyndall, that "it is not purchased at the expense of the vitalizing constituent of the atmosphere."

To rate-supported libraries, the question of expense for any form of artificial light must of necessity be one of importance. But a so-called expensive system of lighting, whether by the use of ventilating gas-lamps or by means of electricity, may, in reality, from various reasons, prove the most economical in the end. In producing the electric light, experience appears to differ considerably on the subject of cost, and especially as to whether the electric current is supplied from a company's depôt or from apparatus erected for the purpose of a single installation. Our experience at Reading on this matter may be of some interest. The contract between the Library Committee and the Reading Electric Lighting Company specifies that the sum of £80 per annum shall be paid for supplying the current to the eight arc lamps to be used in the library and reading-rooms, for providing the necessary carbons, and for keeping the lamps in order. It was considered that 100 glow lamps, of 8-candle power each, would be required to illuminate the library and rooms for reading purposes only, and to supply the electric current and renewals to these lamps would cost at the rate of £150 per annum. To supply the current and renewals to a sufficient number of large incandescent, or "Sunbean" lamps, of 300-candle power each, would cost about £250 per annum. These prices, from a public company, both for arc and glow lamps, are probably exceptionally low, and cannot be taken as a standard of the cost for electric lighting for library purposes. The arc lamps in operation at Reading are nominally of 1200-candle power each. Some 50 to 60 per cent. of the illumination is, however, absorbed by thick opal globes, which are not only necessary in order to protect the eyes from the acute and

dazzling rays, but also because, by their use, the light is admirably diffused, and heavy shadows prevented. The total illuminating power at the library is, therefore, equal to about 4320 candles. If 100 8-candle power glow lamps had been adopted, the expense for lighting would not only have been nearly double that for arc lamps, but the total lighting power would have only been equal to about 800 candles. The cost for the gas consumed in the library and reading-rooms last year was £79 odd; while the total illuminating power was equal to some 1360 candles. The result of our experience at Reading with electric arc lighting demonstrates the fact that excellent though this method undoubtedly is for the purpose of illuminating lofty rooms, the flickering and occasional failure of a lamp to light, from one cause or another, shows that the system is not perfect.

FUEL GAS AND SOME OF ITS APPLICATIONS.

At the recent Meeting of the Iron and Steel Institute in New York, a paper on the above subject was presented by Mr. BURDETT LOOMIS, of Hartford (Conn.); but, owing to want of time, it had to be taken as read. The following is the text of the communication, which was accompanied by a number of plates illustrating the Loomis plant for the manufacture of water gas (described and illustrated in the JOURNAL for Aug. 6, 1889), and the application of the gas to various kinds of furnaces.

The advantages of gaseous fuel have been too fully set forth during the past few years to need recapitulation. Papers, arguments, and editorials have been issued, in a more or less general way, that would make volumes. Systems have found zealous advocates, and promises of results made, that have sounded strangely in the ears of old-fashioned gas makers, have been born of theory, and have died in the earliest throes of trial; while in some few instances success has demonstrated the value of practical effort. With few exceptions, however, everything attempted or accomplished has tended towards the one end—the realization of more perfect results than we can obtain with the direct use of solid fuels; and there are to-day few to dispute the coming supremacy and general use of gaseous fuel.

It is not assumed that the solid fuels will be wholly superseded. Such an assumption would be folly; as there are circumstances in which solid fuels must continue in use, from necessity or economy. These, however, are few, and can almost be named in a breath; while the purposes for which gaseous fuel is not only cheapest, but best, are so many as almost to defy enumeration. Wherever a constant high flame-temperature is necessary, the gaseous form must find precedence, while its easy carriage to long distances, and its attainment of maximum temperature almost instantaneously with ignition, give it a leverage that is scarcely covered by that easy term "convenience."

The discovery and application of natural gas has not only borne the weightiest of testimony on behalf of the general necessity for fuel gas in nearly all fields, but it has done more. Its wide scope of service—from the great establishments wherein thousands use it constantly, to the cottage where it saves countless steps for the housewife—has demonstrated the necessity for a gas of general application, that will fulfil all the demands of the manufacturer, and meet the wants of the domestic user. The fuel gas that is to score a wide success must satisfy these conditions; for a gas that will not, the field is limited.

In the manufacture of a fuel gas, then, it is obvious that certain conditions are primarily necessary. As concerns the apparatus to be used, these are: (1) Simplicity; it must be easily and cheaply worked, and require a minimum of skilled labour. (2) Durability; it must do its work with but little repair or replacement.

As to the material to be used in the manufacture of the gas, the conditions are: (1) Richness; it must contain the necessary carbon. (2) Cheapness; it must be generally obtainable in large quantities at low prices. These qualifications are met by the slack or fine bituminous coals, which are the least expensive of all coals, and are obtainable in nearly all markets at low rates.

These points established, it remains to decide upon the kind of gas to be made. This must be calculated to meet all the wants of those for whose use it is intended. Here we find it necessary to consider the following: (1) Quality; the gas must contain all the carbon possible, consistent with the other necessary conditions. (2) Cost; it must be low in cost, especially in view of its use in large quantities. (3) Cleanliness; it must be as free as practicable from impurities, and must be clean as regards the more perceptible. (4) Transmission; it must be capable of easy carriage to reasonably long distances, and through small as well as large pipes. (5) Temperature; it must have a constant high flame-temperature, and must ignite under all conditions, when desired. For general adaptability to the wants of all classes of consumers, the requirements named must be met; and the more completely they are met, the greater will be the success of the gas offered.

In many cases, a good producer gas accomplishes all that is needed; and, used in a well-constructed regenerative furnace, it is much cheaper than coal. But its usefulness is confined to places where such furnaces can be constructed, if high flame-temperature is required, or where low heats are sufficient, and obtained without regeneration. Outside of such confines, it is not economical, and is seldom useful.

Without discoursing on the relative merits of other gases, I believe that the gas best suited for general fuel purposes is water gas. Its flame-temperature is high, it is cleanly, reasonably free from impurities, and it can be transmitted to long distances. The one possible factor to which objection might be made is its cost. If it meets this requirement, there is no further bar to acknowledgment of its claims. Can it be made from the cheapest of materials offered in the general market for gas-making purposes? In discussing the lions in the path of success in this direction, the London JOURNAL OF GAS LIGHTING some months ago pronounced the following *ultimatum*: "The slack, however wet, dirty, dusty, sulphurous, or stony, should be tipped into the hoppers of the gas-making cupolas, and gasification should go on continuously and completely, so that nothing but gas and ashes should remain of the material put into the apparatus." This can be done, and is done in many places, with the Loomis apparatus, which is using the cheap coals mentioned, as well as the more expensive anthracite coals and coke. This apparatus is the only one I know of in successful operation making water gas directly from the bituminous slack coals that are found in abundance in many parts of the world. It is a simple fuel gas-generating machine, and it will not only make as much water gas from a ton of this slack coal as can be produced by any other method from the same quantity of anthracite or coke, but it also utilizes the blast gases for making the steam necessary to run the engines and exhausters, and for decomposing, leaving a surplus for other work; or the blast producer gas or generator gas can be used in regenerative, reheating, annealing, melting furnaces, &c. For these purposes, the producer gas made by this apparatus answers all requirements, as can be shown by demonstration in the several places where it is so used.

Water-gas generators, to be economical producers of gas, must be so constructed that they will continuously make a first-class quality of gas for the full period of a 24 hours' run. In all the generators using the up-blast system, after a few hours' run, the quality of the gas has become much poorer than at the beginning, when the fires were fresh, on account of the clinkers and ashes that accumulate. In the Loomis generator this is obviated; and the gas is of as good quality at the end of a 24 hours' run as at the beginning or any part of the run. This is due to the peculiar construction of the generator, and the action of the exhauster in collecting the ashes at the bottom of the fire and in the ash-pit. In the process of exhausting before making a run of water gas, this is highly heated, and useful for superheating the steam before it strikes the incandescent coal. In this way the carbon is nearly all extracted from the coal, less clinker is made, the gas is freer from carbonic acid, and increased production is obtained.

In the matter of quality, a high grade of product should be aimed at, and the water gas made as pure as possible, so that it can be used, where practicable, without purification. In works where it must be purified, the better the quality of the gas, the less the expense for purifying. The claim has been made that the water gas that can be made from a given amount of coal must be less economical than the coal used directly, both on account of the smaller number of units of heat contained in the gas, and the labour and expense of making. Where coal can be well fired, and gases economically burned direct from the furnace, this is in many instances true; but the great fields for water gas lie in the special uses for the many kinds of metallurgical and kindred work where coal directly used cannot enter as a comparative factor, and for domestic purposes, where the gas is proving itself as cheap as, if not cheaper than the coal, while it accomplishes results that are not obtainable with the solid fuel.

In estimating the economy of its general uses, another factor must be considered. This is application. In this particular, the threshold of investigation has scarcely been crossed, yet much has been accomplished, while the future is fruitful of certain realization. Until lately, the gas has not been obtainable for the purposes of experimenting in large quantities; and as yet, in special work, the methods of application are comparatively crude. Within the past few years, however, much has been done in the face of untoward circumstances; and the gas can now be shown in use in many ways where it has supplanted coal, and wherein it has been found more economical than firing by coal, without taking into consideration any other features of advantage.

In nearly all branches of metallurgical work wherein the gas can be applied, however, there is found an increased product, a better grade of product, and direct economy in cost. Increase in the amount of product arises from the saving in direct labour, as can be most easily seen, perhaps, in forge-shops and the like, and from the gain in the personal condition of the workmen, owing to the increased healthfulness of their surroundings. The gain in the grade of product arises chiefly from the uniformity in the temperature and the quality of the fuel. The economy in cost needs no explanation. I may state, however, that in some large works which have changed from coal to the use of fuel gas, the gain in direct economy has been proved to be from 33⅓ to 50 per cent. in labour, and upwards of 40 per cent. in fuel. In many instances, the gain from having a sharp, quickly heating flame is such as to overbalance the question of more direct saving in cost of production; and it is not infrequently demonstrated that, by this means, enough workshop material is saved to alone pay all the productive cost of the gas.

Another feature worthy of consideration is economy of space in locating furnaces or other appliances for the use of the gas, especially where it is desirable that these should be grouped together as closely as practicable. It also renders possible the location of furnaces, heaters, forges, &c., just where desired, without the necessity for considering the questions of convenience that frequently arise where there must be either coal carriage or storeage. With this, too, may be considered the fact that the heat from the gas is brought under closer control than that from the coal fires; and there is less heat generated into the room or space surrounding the point of application. This perhaps may seem of minor importance; but in these days of sanitary investigation, and of shortening the days of labour, it will be found no little advantage to keep the temperature of a workroom as far as possible under control.

In many parts of the world inventors are devising new applications of this gas, and with marked success. It is so well made and so easily handled, that its application in many new channels amounts to little more than ordinary manipulation and direction by those who understand the work to be done. Among the several places in this country where the gas made by the process I have named has been applied to such a variety of uses as plainly shows its adaptability as a general fuel, as regards both efficiency and cost, are the saw-works of Messrs. Henry Disston and Sons, which you will be invited to examine on your journey from New York to Philadelphia. There you will see the generators at work on steady and continued runs; and will see the two gases—*i.e.*, the water gas, and the producer gas that is made intermittently with the water gas—both carried to holders, and delivered under pressure at different parts of the works. This is the first place of which I have knowledge where producer gas has been stored in a

holder, and thence delivered cold to different furnaces at distances from the generators; being fired cold at such distant points. The process of manufacture and the manifold utilization of the different gases, but especially of the water gas, will be of interest. Full facilities for a thorough examination of the process of manufacture will be given, as well as full liberty to make any tests or experiments desired.

The following is the estimated cost of 1,000,000 cubic feet of water gas, based on actual results, with coal at $3 per ton:—

Coal—25 tons, at $3 per ton	$75
Coal for steam—3 tons, at $3 per ton	9
Labour	22
Extra for supplies and repairs	4
Purifying	5
	$115
Received for producer gas	40
	$75
Interest on plant and depreciation	25
	$100

Cost per 1000 cubic feet, 10c.

In the practical using of water gas, 20,000 cubic feet often yield better results than a ton of coal directly fired; in some cases more is used. This has been accomplished by new and better methods of application; and it will be improved upon as necessity demands and appliances are perfected.

I may say, in conclusion, that in no place where this gas has been put into use has any thought been given to a return to coal. The solid fuel, once supplanted, will never be sought for again.

By way of supplement to his communication, Mr. Loomis furnished the following actual results obtained in melting brass in crucibles with water gas used in an improved furnace: In melting 2000 lbs. of brass in 100-lb. crucibles, 12,000 cubic feet of water gas were consumed. In using the same sized crucibles in works that are melting from 5 to 10 tons per day with coal, it takes 2000 lbs. of coal for 2000 lbs. of brass. Units of heat in 12,000 cubic feet of water gas used, 3,600,000; do. in 2000 lbs. of coal used, 27,000,000—being 7½ times the amount in the gas used. One ton of coal will make 40,000 cubic feet of water gas, which will accomplish as much as 3½ tons of coal in this work. The cost of labour in making water gas will be less than in firing coal direct. The producer gas made, in addition to 40,000 feet of water gas from a ton of coal, will yield all the steam needed, and pay interest and repairs on the plant. The coal used for making the gas being bituminous slack, only costs two-thirds as much per ton as that used with direct firing—one ton of coal to make the gas costing $3, 3½ tons at $4·50 per ton will cost $13·50; showing a saving of $10·50. As it only requires two-thirds the time to melt with gas that it does with coal, there is a great saving; and less space is needed for furnaces, as only one-third the number are needed. Metal is not wasted in the ash, and the crucibles will last much longer.

Mr. Loomis also gave the following additional particulars:—

In estimating the comparative cost of labour and fuel in making water gas from bituminous or anthracite coal, there is in the Eastern States and in England a difference of about $1·50 per ton between the cost of bituminous slack and coke or anthracite; and the estimate will be made on this basis. Where it is more or less, allowance can be made: 2000 lbs. of Cumberland slack will make 40,000 cubic feet of water gas with 340 heat-units per foot, or 13,600,000 units per ton. Cost of coal, $3; cost of labour per ton of coal, $1—total, $4. The producer gas makes steam. Thus 1,000,000 heat-units cost about 30c. If the balance of the producer gas could be utilized after making steam, it would reduce the cost of the water gas as low as 25c. Taking 2000 lbs. of anthracite coal or coke, the cost per ton is $4·50; the cost of labour per ton of coal, $1; coal for raising steam, 75c.—total, $6·25. If it makes 40,000 cubic feet, at 300 heat-units per foot, or 12,000,000 units per ton, 1,000,000 units would cost 52c., or nearly double that of the gas made from bituminous slack. The extra heat-units in gas made from bituminous coal are obtained from the marsh gas and illuminants which give the gas a decided odour.

In the course of the paper reference was made to the proposed visit of the members of the Institute to Messrs. Disston's works. They were also invited by the Waltham Watch Company to inspect their vast establishment, where a variety of uses for water gas, different from those at Messrs. Disston's, could be seen. Mr. J. E. Addicks, of the Boston Gas Company, likewise expressed his pleasure to have the Company's works shown to any of the members who might visit Boston. There fuel water gas is made and measured with a meter, and the producer gas used to fire boilers to make steam, to heat retorts, and to volatilize the oil to carburet the water gas to make it illuminating. The Company will distribute fuel gas through six miles of mains by the 1st prox. The quantity and quality of the water gas made is upwards of 40,000 cubic feet of 340 heat-units per foot, from 2000 lbs. of Cumberland coal. The Akron (Ohio) Fuel Gas Company have 10 miles of mains, and are distributing water gas for household and other uses.

Increase in the Price of Gas at Boston, Lincs.—The Directors of the Boston Gas Company have issued a notice stating that, owing to a rise of 4s. per ton in the price of coal, and an advance in the price of other materials requisite in the manufacture of gas, they are reluctantly compelled to make an advance of 5d. per 1000 cubic feet in the price of gas, as from Nov. 1.

Water-Works for Duffield.—At the request of the Belper Rural Sanitary Authority, Mr. W. H. Radford, C.E., of Nottingham, has sent in alternative schemes for the water-works at Duffield; and they are now under consideration. In one scheme, Mr. Radford proposes to take the water from the Hazlewood spring, and store it in a service reservoir, and supply by gravitation; any future deficiency being made good by putting down the pumping-station mentioned in the alternative scheme. In the latter, Mr. Radford proposes to pump river water from the alluvial deposit, after natural filtration through sand and gravel; the water being pumped into a summit reservoir to command the district.

REGISTER OF PATENTS.

Separating Tar and Ammonia from Blast-Furnace and like Gases.—Mackay, F. N., of Freshfield. No. 14,060; Sept. 6, 1889. [8d.]

The object of this invention is to cool blast-furnace and like gases and remove the tar and ammonia or other products therefrom; the process for accomplishing this object consisting in: (1) Employing the cooled gases from which the tar and ammonia have been removed to reduce the temperature of the gases to be treated. (2) Submitting the gases to the action of oil or the like, so as to remove the tar; and then to the action of water, to remove the ammonia, or *vice versâ*. (3) Combining with washing-towers, for removing the tar and ammonia, drying-towers, for separating oil and water from the gases; and so constructing the apparatus that the gases leaving the furnace pass around the gases being treated. (4) Providing means for circulating the various fluids, so as to obtain continuous action. (5) Combining the apparatus with coolers of the usual construction; the appliances being separated from each other by, or having between them, blow-off or anti-ignition valves.

Preventing Gas-Brackets moving or their Joints Self-Acting.—Vickermann, W., of Lockwood, near Huddersfield. No. 15,742; Oct. 8, 1889. [8d.]

This invention refers to improvements in the swivel-joints of gas-brackets, branches, pendents, or other like fittings; and consists in means for enabling these branches or brackets (moveable about a centre) to be retained in any position to which they may be moved. The object is to render it impossible for the brackets to move from their position of their own accord, and in this manner prevent the firing of any inflammable substance near.

The idea is to employ two opposing clutches or toothed or serrated surfaces, one of which is secured to the end of one pipe, while the other is placed loosely on the corresponding end of another pipe, connected to the first pipe by an ordinary loose joint. When a pipe or bracket is being moved on its pivot into any desired position, the moveable clutch is held out of gear with its corresponding opposing clutch, by the hand, or by a suitable form of lever centred on one of the pipes of the bracket; but when it has been placed as desired, the moveable clutch is put into gear with its opposing clutch, either by its own weight, or by the lever, or by means of a spring, so that the bracket which has been moved is held in position until the parts are again manipulated by hand.

Combined Steam and Gas Motor Engine.—Haedicks, H., of Remscheid, Germany. No. 17,008; Oct. 28, 1889. [8d.]

This gas and steam motor engine consists of a combination with the motor engine of a steam generator and a gas producer, so arranged that the hot combustible gases from the latter are made to pass through the steam generator, and to supply the necessary heat for raising steam without entering into combustion; the cooled gases being subsequently compressed and mixed with air, so as to form an explosive mixture. This operates in one end of the engine cylinder; the steam from the generator being made to act in the other end.

Treating Gases from Blast-Furnaces, Gas-Producers, and Coke-Ovens.—The Coltness Iron Company, Limited, of Glasgow, and Young, W., of Priorsford, Peebles, N.B. No. 17,673; Nov. 6, 1889. [1s. 1d.]

This invention has for its object the treatment of gases from blast-furnaces, gas-producers, and coke-ovens, with a view to the separation of their constituents in a more satisfactory manner than heretofore.

In carrying out the invention in the case of blast-furnaces, the first operation consists in separating from the gases, while still in a highly-heated state, the dust which they mechanically carry from the furnace, in consequence of the velocity with which they pass through the materials in the furnace. This operation is effected while the gases are still hot, in order that no tar may be condensed and associated with the dust. Separation of the dust in this way is said to greatly facilitate the subsequent treatment of the gases; diminishing the amount of purification required, and improving the resulting products. Any suitable arrangement of apparatus may be used in which the velocity of the gaseous current is, once or oftener, temporarily diminished to allow of the deposition of the dust.

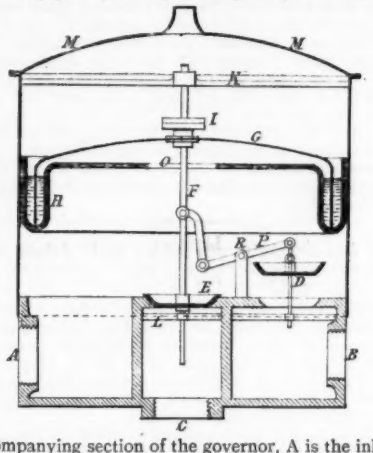
The second operation consists in separating from the gases sooty tar, which would tend to choke the pipes and apparatus if left to be deposited at a later stage; and this is effected in a manner to facilitate subsequent distillatory processes. At a later stage, watery tar is separated from the gases by cooling and condensation; and it is this watery tar which is used to separate the sooty tars from the still hot gases, freed from the mechanically suspended dust. The operation may be effected in any suitable gas-scrubbing apparatus; and in such apparatus, while the sooty tars are absorbed by the watery tar, the heat of the gases evaporates the water, and leaves the mixed tars in a dry or comparatively dry condition, in which state they can be more conveniently and satisfactorily distilled than when they have water mixed with them.

The gases leaving the scrubbing apparatus referred to will still contain the more volatile tar oils and the ammonia, which may be separated from them by ordinary surface condensing apparatus—the last traces of ammonia being obtained by washing and scrubbing the gases with water, as is done in gas-works: or the gases may be scrubbed or washed with sulphuric acid, to directly obtain the ammonia as sulphate; or the gases may be cooled to 100° Fahr., to recover the tar and part of the ammonia as ammoniacal liquor, after which the gases may be passed through, or in contact with, sulphuric acid, to separate the last traces of ammonia.

The constructive details of the apparatus used in carrying out the invention may be considerably varied; and the patentees show, on six sheets of drawings, and describe in detail, examples of apparatus which they believe to be well adapted for effecting the desired operations in a satisfactory manner.

Gas Distributing Governor for Heating and Lighting Gas.—Carnaby, S., of Liverpool. No. 18,092; Nov. 13, 1889. [6d.]

This invention relates to a governor for use with a system of distributing heating and lighting gas such as that invented by Mr. B. H. Thwaite, by which gas companies can supply gas for heating, smelting, and similar purposes through one meter in the daytime, and gas of higher illuminating power through another meter at night time, using the same service-pipes, by merely altering the pressure at the works.



In the accompanying section of the governor, A is the inlet from the service-pipe; B, the outlet to the night meter; C, the outlet to the day meter; and D, a conical or mushroom valve for admitting and shutting off the supply to the night meter. E is a similar valve for admitting and shutting off the supply to the day meter. F is a rod or spindle to which the valve E and the inverted metal cup G are attached. H is an annular trough, filled with mercury or glycerine, in which the edge of the inverted cup G floats, and prevents the gas getting into the top of the governor. I are moveable weights for adjusting the pressure at which the gas shall be diverted from one meter to the other. K is a narrow bar across the governor with a hole through for guiding the top of the spindle F, so that the valve E shall rest fairly in its seat when closed. M is a moveable cover for the governor; and N is a small air hole to permit the inverted cup G to rise and fall. O is a passage through the centre of the annular trough for the gas to reach the inverted cup G.

Now, with gas supplied at the ordinary pressure, it will flow in at A through the valve D, and out at B, to the night meter; but when the pressure is increased (as would be the case in supplying gas for heating, smelting, and similar purposes), it raises the inverted cup G, and with it the spindle F and valve E, allowing the gas to pass to the day meter, through the outlet C, at the same time closing the valve D and shutting off the supply to the night meter. The valves D and E being connected on the balance by means of the bar P, pivoted at the point R, it follows that when one is closed the other must be open; and the exact pressure at which it is desired to divert the supply from one meter to the other is readily adjusted by the moveable weights I.

Manufacture of Illuminating and Heating Gases.—Wood, W., of Philadelphia, U.S.A. No. 19,572; Dec. 5, 1889. [8d.]

This invention relates to apparatus of the class in which hydrogen gas is produced by the decomposition of steam in the presence of incandescent carbon. It consists of improvements whereby the steam may be superheated before it passes to the incandescent carbon, oil introduced into the generator or between it and the fixing chamber, and the products led to the cooler part of the fixing chamber at pleasure.

Fig. 1.

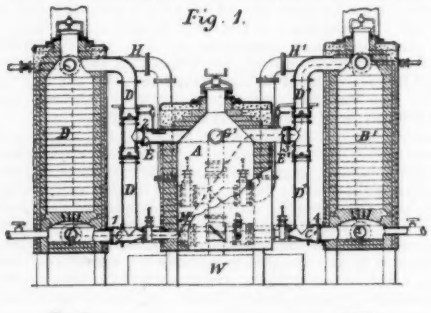
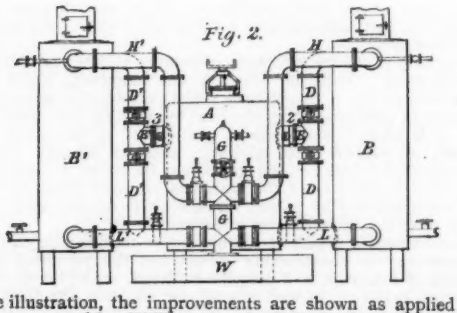


Fig. 2.



In the illustration, the improvements are shown as applied to the apparatus patented by William Moreland Cosh—No. 5181 of 1889; but they are applicable wholly or in part to other apparatus for the manufacture of water gas. Fig. 1 represents the apparatus, partly in side elevation, mainly in section. Fig. 2 is a back elevation.

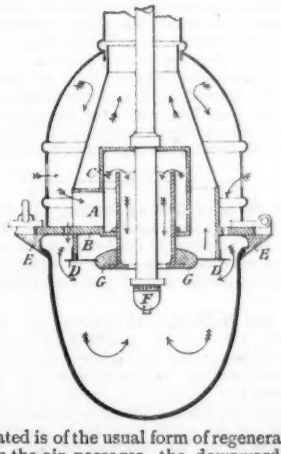
A is a gas generator adapted to receive a charge of coal. Below the grate M is a pipe to admit the air blast with a steam supply connected therewith. On each side of the generator is built a chamber B B¹ adapted to act as a fixing chamber or as a superheater. These are to be filled with pieces of any suitable refractory material through which the steam may freely pass and be heated in its passage. These superheaters have each a combustion chamber in the base, connected by pipes C C¹ directly with the space in the generator beneath the grate M. From these pipes vertical pipes D D¹ extend to the upper part of the fixing chamber, and are provided with branches E E¹, communicating with the upper part of the generator; suitable valves serve to establish communication between the generator and the fixing chamber, while other valves cut off connection between the generator and the combustion chambers. Another set of pipes connect the upper part of the superheaters and the generator with the purifying chambers W. Of these pipes H H¹ are exit-pipes from the superheaters. They extend from the upper parts of the superheaters, and are turned to meet in a pipe G, which is the exit from the generator, and extends down therefrom to the wash-box; the entrance to the generator being at G¹. From the lower portion of the pipe G, two pipes L L¹ lead from the lower part of the fixing chambers B B¹. The pipes G, H, and H¹ have valves by means of which communication may be shut off between the upper portion of the superheaters or the upper part of the generator and the wash-box. The valve in the upper extension of the pipe G, above the junction of the pipes H and H¹, closes the passage when the other valves are open. In addition to the steam supply-pipe, there are those leading into the upper portion of the chambers B B¹ and in the upper extension of the pipe G. In addition to these pipes is one entering the upper part of the pipe G, for supplying naphtha or other liquid hydrocarbon; and in the branches E E¹, or pipes D D¹, are pipes for introducing liquid hydrocarbon either with or without the addition of steam.

The apparatus is capable of a variety of methods of use for the production of water gas, all of which are fully described in the specification. Our readers will, however, be most interested in knowing how it works for the manufacture of illuminating gas.

In accordance with this method, after the requisite heat has been obtained, steam is admitted at the top of the superheaters B; and it passes through the heated material therein to the bottom of the generator through the connecting-pipes in a superheated state. It then flows up through the incandescent coal; and, by removal of its oxygen, is converted into hydrogen gas. In the top of the generator, or in the pipes E E¹ or D D¹, it meets hydrocarbon vapour, from the liquid hydrocarbon introduced in any suitable way; and the hydrogen, with the vapour taken up, passes to the bottom of the superheater B¹, and in ascending through the highly-heated material therein, it becomes fixed, and thence passes through the outlet-pipe to the wash-box, as already explained. The direction of the passage of the steam may, of course, be reversed in this method of operation, and be made to pass down through the coal and from B to B¹. The operation could also be varied by closing and opening certain of the valves, so that the current of decomposed steam and hydrocarbon vapour could be made to pass into the upper part of the fixing chamber B¹ and pass out through the pipe L¹ to the wash-box. This process, too, could be reversed by the opening and closing of appropriate valves, so that the products should pass into the upper part of the fixing chamber B instead of into the chamber B¹. By inserting valves at 1, 2, 3, 4, the steam and gas may be passed in substantially the same manner through the machine, although in different directions, with (says the patentee) possibly better results.

Regenerative Gas-Lamps.—Brown, A. O., of Glasgow. No. 10,644; July 9, 1890. [6d.]

This is a modification of patent No. 3838 of 1888. According to the former invention, air was injected through an opening in the bottom of the globe and led up through the burner, mingling with currents of down-flowing air, which became highly heated in its passage before reaching the flame. But by dispensing with the bottom burner fittings, using a much simpler form of burner, and excluding the air altogether from entering at the bottom, nearly the same illuminating results are said to be obtained.



The lamp illustrated is of the usual form of regenerative lamps now in use; A representing the air passages, the downward elliptical or oval form of which presents a great heating surface to the overflowing air in its passages to the heating chamber. The waste gases or products of combustion pass through the openings formed by these passages up

to the chimney, and in their course impart heat to the inflowing air. The parts B and C are cast together. The deflector D is made in the shape of an annular ring, of thin metal or other suitable material, secured in position by a bayonet joint. The underface of the deflector and the ring G (which suspends the globe) are enamelled. Very satisfactory results are said to be obtained by elevating the burner F ⅜ inch or thereabouts from the refractory ring G of the lamp, and without the employment of any kind of perforations whatever. The perforations I near the top and J at the bottom of the casing H provide openings for the ingress of air to the lamp for feeding the flame. The air so entering is intercepted by louvres or annular luffer-plates K K¹ L L¹, and is thereby converted into the hot uniform currents of air requisite for the perfect combustion of the lamp.

Low-Pressure Water-Meters.—Parkinson, W. C., of Cottage Lane, City Road, E.C. No. 11,798; July 28, 1890. [6d.]

This invention in low-pressure water-meters has for its object the production of means whereby the meter, when passing but a small quantity of water in proportion to its size, will register the water so passed with greater accuracy than in ordinary meters.

Fig. 1.

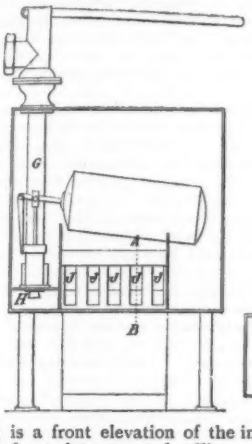


Fig. 2.

Fig. 3.

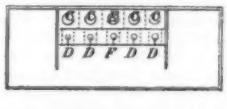


Fig. 1 is a front elevation of the inlet chamber of a water-meter, with the front plate removed. Fig. 2 is a transverse section. Fig. 3 is a part plan, showing the holes leading to the water-conduits.

In the larger sizes of ordinary low-pressure water-meters, the patentee remarks, only a definite proportion of the water passed is measured, while the remainder flows through bye-pass holes of similar area direct to the cistern. As hitherto made, with only one row of holes C placed at a given height, there is the liability of an undue proportion flowing through the bye-pass holes when the meter is passing only a small quantity in relation to its size. To obviate this imperfection, another row of holes D is made at a different level and of smaller area, arranged so that each hole communicates with a channel of exactly the same size and shape as the others. The central holes E and F in both tiers lead to channels, which convey the water through the spout to the measuring chamber, while all the other holes lead the water through their respective channels direct to the cistern.

The action in the apparatus is as follows: The water enters by the inlet-pipe G, passes through the valve at H, and goes into the inlet chamber I, where (supposing anything like the full quantity is being passed) it rises over the top of the series of holes C, and from thence flows away to the measuring chamber and cistern. Supposing, however, the quantity being passed is small, the water will rise to the holes, but, in consequence of the want of velocity, there is the liability of a greater proportion escaping by the holes C than by the hole E, and therefore the meter will register slow. To obviate this the series of holes D and conduits J are placed in this new apparatus, so that when a small quantity of water only is passing, although the velocity may not be great, it will be sufficient when the water rises to the top of the lower series, to flow away by the holes D and the hole F in the required proportions, and the meter will, as a consequence, register accurately.

APPLICATIONS FOR LETTERS PATENT.

13,760.—Bickerton, H. N., "Improvements in gas-engines." Oct. 6.

15,788.—Newman, N., "Improvements in automatic gas lighters and extinguishers." Oct. 6.

15,807.—Campion, A. J., and Tenison-Woods, J. E., "Improvements in steam boilers and motors by a new method of applying combined steam, air, and gas." Oct. 6.

15,936.—Lanchester, F. W., "Improvements in the igniting arrangements in gas-engines." Oct. 8.

15,990.—Petit, G., and Blanc, E., "Improvements in apparatus for carburetting air or forming explosive mixtures for gas-engines or other apparatus of the like kind." Oct. 8.

15,994—Stuart, H. A., and Binney, C. R., "Improvements in or connected with engines operated by the explosion of mixtures of combustible vapour or gas and air." Oct. 8.

16,065.—Hawkyard, J., and Braddock, J., "Improvements in gas-regulators." Oct. 10.

16,167.—Hilton, J. H., "Improvements in apparatus for carburetting gases." Oct. 11.

16,207.—Siemens, F., "Improved means of utilizing waste gases in regenerative gas-furnaces." Oct 11.

16,213.—Coze, A., "Improvements in apparatus for charging inclined gas-retorts." Oct. 11.

CORRESPONDENCE.

[We are not responsible for the opinions expressed by correspondents.]

Mr. Irving's Remarks at the Meeting of the South-West of England Association.

Sir,—In the report of the recent meeting of the South-West of England District Association in your last issue, some confusion seems to have been made between the remarks made by me on Mr. N. H. Humphrys's practical paper, and other remarks afterwards made, when, at the request of the President, I informerly described a hydraulic main arrangement in use at the Stapleton works of the Bristol Gas Company. I am reported to have advocated "keeping the hydraulic main at a high temperature." What I did say was that experience had proved that it was advisable to separate the tar from the gas at a comparatively high temperature (not less than 100° Fahr.); and that this could well be done at the hydraulic main.

D. Irving.

Stapleton Gas-Works, Bristol, Oct. 15, 1890.

Electric Lighting at Hastings.

Sir,—In the Journal for the 7th inst., a letter appears from the Engineer and Manager of the Hastings and St. Leonards Gas Company, in which reference is made to my paper on "How to Maintain and Increase the Popularity of Gas," read before the members of the Eastern Counties Association of Gas Managers at their recent meeting at Yarmouth.

I do not desire to enter into a controversy with Mr. Botley on Gas *versus* Electricity at Hastings; but surely he does not wish to presume upon the intelligence or credulity of your readers to suppose they will accept his statement that the difference between an electric light of 10 ampères 50 volts—or as he prefers to call it 300-candle power—cannot be distinguished from an ordinary street-lamp, except when quite close to it. He also very inadequately explains away "the considerable misconception" as to the *actual amount* of this kind of lighting. He ought to have stated that there were 23 arc lamps in use other than the 15 on the front line, and also that the principal hotels, clubs, business premises, and church have adopted the electric light. As to the Pier Pavilion, whether an experiment or not, the four arc lamps substituted for gas have proved quite a success.

We are well aware that electric lighting is far from perfect; but electricians are doing their best to remove the imperfections; and intelligent gas managers fully realize the importance of this rival illuminant, and, I have no doubt whatever, will do their utmost to maintain the popularity of gas.

J. Lees.

St. Leonards-on-Sea, Oct. 17, 1890.

The Gas Workers' Union and its Executive.

Sir,—W. H. Ward, of the Gas Stokers' Union, does not seem inclined to oblige with the information you asked him for on page 488 of the Journal for Sept. 2. Can it be that he thinks "discretion the better part of valour"? Or perhaps he is "lying low" after the knock-down his Union received at the meeting with the Chartered Company's Directors the other day, when the Executive of the Union had the audacity to ask the Company to become collectors for them, and gather in the poor dupes' pence, to enable the "Executive" of the Union to be well fed and clothed this coming winter, without working. Their hands must, of course, be getting very soft by this time; and handling the rake and scoops will perhaps soil them and make them hard again.

It is rather surprising that Ward has not seized the opportunity of replying, as he seems rather to like seeing his name in print, and has been heard to say, in one of his outbursts of vanity, "Sure it's myself that's a dab at the pen." It should not take him very long to say what amount of "strike pay" was doled out after the eight weeks he mentions, and how many weeks 2s. was paid (if he calls that amount per week "strike pay"); how many got 1s. a week; how many men who got a day or two of work were docked half that they earned; and how many were fleeced of 1s. 8d. off each day they worked.

It is perhaps not generally known by the public and the strikers that, for every day's work any of them did, the Executive demanded from them half they earned, and in some cases 1s. 8d. a day. So that the poor fellows were working for the Union, and were not allowed to keep the wages they earned to take home to their starving wives and little ones. It had to go into the Union box, to pay the "Executive" full wages; for you may depend upon it they did not have short-commons or go hungry to bed, like so many "scores" of their bull-dozed poor fellows.

But it is evident that the stokers are now beginning to see through the hollowness of the pretensions of Thorne, Ward, and Co., and are getting tired of their bounce and bluster and the want of truth of these self-styled leaders. Only fancy Thorne saying the other day at Woolwich, "The Union had never sanctioned a single strike." What faith or belief can the men put in any words he may hereafter utter? After that it is quite time Thorne and Ward took off their coats and went to work like the rest of the men, and not loaf about and get fat on other stokers' well-earned money which does not belong to the Union.

In the Know.

Oct. 17, 1890.

P.S.—As some of the stokers among your readers may not quite understand the meaning of the word "bull-dozed," those who have been in America will understand that it means to be crammed and surfeited with a repetition of misrepresented facts put forward with some show of authority in order to mislead and deceive others.

The System of Inclined Retorts.

Sir,—I shall be glad if any of your readers can give me some definite information as to whether there is any patent for the "inclined retort," or if the patent is only confined to the system of "charging the retort."

Interested.

Oct. 16, 1890.

MISCELLANEOUS NEWS.

THE RAILWAY COMPANIES AND THE CONVEYANCE OF GAS COAL.

It will be remembered that about a twelvemonth ago a Committee was formed, under the title of the Railway Rebates Committee, on the initiative of Mr. J. Deakes, of Worcester, to take some steps on behalf of the gas undertakings of the country, especially of the Midlands, in regard to the decision come to by the Railway Companies, to abolish, under the provisions of section 27 of the Railway and Canal Traffic Act, 1888, the rebate hitherto allowed on gas coal. The Committee appointed certain of their number a Sub-Committee to carry out the object in view; and these gentlemen have lately issued a report of their proceedings, the principal portions of which are given below.

It will be remembered that at the time of the appointment of the Sub-Committee in 1889, the Railway Rebates Committee had been informed by representatives of the coal-owners interested in the withdrawal by the railway companies of rebates on gas coal, that the companies had repeatedly expressed willingness to grant such rebates if it could be ascertained that they had the legal power to do so, and also that the companies had stated that an agreement had been come to, that a friendly case should be submitted to the Railway Commission, for the purpose of obtaining a decision on the point. On application to the representatives of the Coal-Owners' Association acting in this matter, and on offering assistance in the presentation of such a case, the Committee were informed that the approach of the long vacation rendered it necessary to postpone the application to the Railway Commission until the autumn of that year. Finding towards the end of the year that no further steps had been taken, and not being able to obtain any satisfactory explanation of the delay, the Sub-Committee made inquiries as to the possibility of proceeding with the case, either with the assistance of the coal-owners or separately; but they were advised that, without the assistance of the railway companies in stating a special case, neither coal-owners nor gas undertakers could proceed.

Believing up to this time that the reluctance to proceed did not extend to the coal-owners, the Sub-Committee next of all addressed themselves to the possibility of giving evidence on the subject at the Board of Trade inquiry, which by that time was being held. With this object in view, they again placed themselves in communication with the representative of the Coal-Owners' Association, and asked for his assistance in the matter. They also asked the Chairman of the Sub-Committee to place himself in communication with the Canal Freighters' Association of Birmingham, with the view of giving evidence at the Board of Trade inquiry. The Chairman of the Committee was informed by the Canal Freighters' Association that they were advised that the proposed evidence was not within the scope of the inquiry. The Honorary Secretary to the Committee then learned that the Coal-Owners' Association were indisposed to take any further action in the matter; that improved trade had tended to this attitude; and that the representatives of the railway companies had suggested to the Association that, as the coal-owners were not immediately affected financially by the change, further action could be postponed without detriment to them. The Sub-Committee thereupon applied to the representative of the Coal-Owners' Association for a formal statement of their position. This statement was promised, but not supplied; and repeated application for it failed to obtain it.

Subsequently, the attention of the Sub-Committee was directed to the following statement in the summary published in *The Times* of the 14th of June last of the Board of Trade report; giving the results of their exercise of the powers granted to them under section 31 of the Railway and Canal Traffic Act, 1888:—

> As an instance in which something has been done by the friendly intervention of the Board, we may take the complaint urged on behalf of the Thorncliffe Iron-Works and Collieries, near Sheffield, that certain special rates for the conveyance of gas coal had been withdrawn as contrary to the undue preference clauses of the Act of 1888. This matter was referred to the Board of Trade, but was not finally settled by them. The Board, however, have been so far successful that they have smoothed the way for a settlement. On the question at issue, whether a distinction can lawfully be made between charges for gas coal and those for other descriptions of coal, the Railway Commissioners are to be asked to pronounce; and a friendly case has been agreed upon between the parties, and will be laid before the Commissioners.

The Sub-Committee thereupon placed themselves in communication with the Board of Trade, with the result that the railway companies were compelled to admit they had withdrawn from their promise.

The correspondence (which is set out in full in the Sub-Committee's report) commenced with a letter addressed on July 17 last to the Assistant-Secretary of the Board of Trade (Mr. Courtenay Boyle) by Mr. Alderman Pollack, stating that a Committee representing the principal gas undertakings in the Midlands, and in other parts of the country, had been formed to co-operate with coal-owners in obtaining a decision from the Railway Commissioners on the question whether a distinction could lawfully be made between charges for gas coal and those for other descriptions of coal. He explained that the formation of the Committee was brought about by the withdrawal by the railway companies, on the Railway and Canal Traffic Act of 1888 coming into operation, of the special rates which they had up to July, 1889, charged for the carriage of gas coal. A very heavy addition was thus made to the cost of coal used in the manufacture of gas—the addition in the case of the Birmingham Corporation gas undertaking alone amounting to about £11,000 per annum. The Committee at that time were informed that the railway companies were advised that this position had been enforced upon them by the provisions of the Act, but that they were prepared to re-open the question if the Railway Commissioners decided that it was open to them to do so. The Committee thereupon placed themselves in communication with the representatives of the coal-owners interested in the matter, with a view to co-operation with them in the submission of a friendly case to the Commissioners, on which they should be asked to pronounce. They had made repeated, but ineffectual, efforts to obtain the submission of this case; and they feared that there was some unwillingness on the part of the coal-owners to urge the matter forward. The Committee would themselves be prepared to submit a case to the Commissioners; but they were advised that, without the co-operation of the railway companies, neither they nor the coal-owners could proceed in the matter. They were also advised that they were unable to proceed by petition; the railway rates on the coal being paid by the coal-owners, and not by the consignees. The Committee had observed in the summary of the report of the Board of Trade, which appeared in *The Times*, that the Board had taken part in the discussion of the matter, and was under the belief that a friendly case had been agreed upon between the parties, and would be laid before the Railway Commissioners. Alderman Pollack therefore asked whether the Board could in any way assist the Committee in urging forward the presentation of the case; or, failing that, whether they could suggest any course by which the Committee could of themselves, obtain a decision of the Railway Commissioners on the subject. He added that when it became apparent that the promised assistance of the railway companies would not probably be obtained, the Committee endeavoured to submit evidence on the subject to the Board of Trade Commission on Railway and Canal Rates; but they were advised that their evidence did not come within the scope of the inquiry. It appeared, therefore, that, unless the Board of Trade were able to assist the Committee, the heavy additional charges which the railway companies had imposed by the withdrawal of the special rates under the provisions of the Act of 1888 would become a permanent tax on the gas consumers who were affected by them.

To this letter Mr. Boyle replied on the 24th of July, transmitting copies of the complaint made in the matter by Messrs. Newton, Chambers, and Co., Limited, of the Thorncliffe Iron-Works and Collieries; of the replies received from the London and North-Western and Great Northern Railway Companies; of a letter from the Board of Trade accompanying the North-Western Company's reply, which was forwarded to Messrs. Newton, Chambers, and Co.; and of a letter from them in regard to the submission of a friendly case to the Railway Commissioners. Mr. Boyle said he was instructed to add that the Board of Trade doubted whether they could interfere further in the matter with any practical result; but that a copy of Alderman Pollack's letter would be forwarded to the Railway Companies' Association for their observations. The following are the principal portions of the letters of Messrs. Newton, Chambers, and Co., and the two Railway Companies above mentioned. The Managing Director of the first-name Company (Mr. A. M. Chambers) pointed out that the interpretation which the legal advisers of the principal railway companies had put upon the "undue preference clauses" of the Railway and Canal Traffic Act had led them to withdraw all special rates and allowances which they had been accustomed to quote for many years past; and that decision, if persisted in, would very seriously damage the gas coal trade of South Yorkshire. He mentioned, as a case in point, that his firm had been supplying The Gaslight and Coke Company with 200,000 tons of gas coal per annum for some years past. The large bulk of this Company's supply was obtained from the Durham coal-field by sea; and in consequence of the low freights which had been in force for many years, and were still ruling, it was impossible for the firm to get any share of their orders if the railway companies charged the ordinary London rate, which varied from 8s. 3d. to 8s. 6d. per ton, including City dues, but exclusive of waggons. In order to enable them to meet the competition of the seaborne coal, the Great Northern, London and North-Western, and Great Eastern Railway Companies had carried this traffic at special rates varying from 6s. 3½d. to 6s. 5½d. per ton. This coal was carried in waggons provided by the firm, and specially built with a view to quick discharge, and in train loads from the pits, and was therefore in a different class of traffic altogether from the ordinary house coal, which required a large amount of shunting and siding accommodation, which in the case of gas coal was not needed. In the case of one gas-works, where from 70,000 to 80,000 tons of coal were used per annum, it was discharged on the Company's own premises. The fact that gas coal was being carried at these special rates was well known to both colliery-owners and coal merchants, and had never been objected to or regarded as detrimental. Mr. Chambers further pointed out that the gas coal trade of South Yorkshire, which included some of the best gas coal in the kingdom, had been built up on special rates which had never been regarded as a grievance by any class of traders. His Company contended that the undue preference clauses did not preclude the railway companies from carrying this class of merchandise at special rates; as it was carried to a different class of traders from the ordinary coal traffic, and was used for an entirely different purpose, and therefore was not the same or similar merchandise. They thought that the railway companies were acting in an unfair manner in practically increasing their rates for gas coal from 10 to 30 per cent. above what they had been accustomed to charge; and that if this was persisted in, no gas coal from Yorkshire could possibly be sent south from a line drawn somewhere from Nottingham to Birmingham. They considered that the companies were by this line of action treating them in an oppressive and an unreasonable manner; and they asked the Board of Trade to give their best consideration to the case, and give them their views upon it. To this letter, Mr. G. Findlay replied on behalf of the London and North-Western Railway Company. He admitted that the statements made therein were substantially correct, and that the course complained of had been taken by the railway companies under the impression that the Railway and Canal Traffic Act prohibited them from making any distinction between gas coal and other descriptions of coal brought to the Metropolis. He stated that at a meeting of railway managers just held, a suggestion was made that measures should be adopted to secure some authoritative decision on the question whether, on the grounds explained by the colliery-owners, an undue preference would exist in the event of the railway companies complying with their wishes. A reply in substantially similar terms was sent by Mr. H. Oakley, on behalf of the Great Northern Railway Company.

On the 12th of August last Mr. Boyle forwarded to Alderman Pollack a letter he had received from the Secretary of the Railway Companies' Association (Mr. H. Oakley), in reply to his of the 17th of July; at the same time expressing regret that the Board did not see that they could be of any further assistance in the matter. Mr. Oakley's letter was in the following terms:—

When the special rates for gas coal were withdrawn, some of the railway companies did contemplate concurring in an application to the Railway Commissioners for a decision upon the question whether the specially low rates for coal when carried for the purpose of gas making constituted an undue preference as compared with higher rates for similar coal between the same places for all other purposes. Upon a careful examination, however, this course appeared impracticable, because the Railway and Canal Traffic Act of 1888 expressly provides, by section 27, that any such difference of rate is *primâ facie* an undue preference, and imposes upon the railway company the onus of justifying it, which in the present case the companies interested, after full and careful consideration, did not see their way to do; and consequently there would have been no question for the Railway Commission to decide. The railway companies observe that the withdrawal of the special rates for gas coal is treated as a grievance by the Committee which Mr. Pollack represents; but, if so, the responsibility for it must be placed elsewhere than on the railway companies. The companies have always believed, and still hold the opinion, that a reasonable latitude allowed them in fixing rates enables them to meet public requirements, and to facilitate trade; but the section above referred to was passed, against the protests of the companies, expressly to restrict such latitude, and to enforce equality in all cases unless the railway companies could show valid reasons, founded upon the conditions of railway conveyance, for differences of rate or treatment. In the case of gas coal it appeared, as stated above, impracticable to show such reasons; and the companies observe that none are suggested in Mr. Pollack's letter.

The Sub-Committee conclude their report by expressing regret that their efforts have been unproductive; but they trust that the record of their proceedings contained therein will show that they have not neglected any opportunity afforded them of endeavouring to forward the object of the Committee. It appears, they say, that the Committee are at present powerless as against the railway companies. They do not, however, believe that the companies will be allowed to take advantage of an Act of Parliament having an entirely different object, for the purpose of permanently enforcing on the public this heavy additional tax. They are confident that sooner or later Parliament will again be appealed to on the subject; and they trust that the action taken by the companies, and, as the Sub-Committee believe, the short-sighted acquiescence of the coal-owners in the position, will be a sufficient warning to gas undertakers to place themselves in a position to be heard, independently of the coal-owners or the railway companies, when the occasion arrives.

THE HEATING AND LIGHTING OF LONDON BY PIPE-LINES.

In another part of the JOURNAL to-day, will be found an article dealing with a pamphlet on the above subject which has lately been issued. It consists of an "open letter" addressed to Mr. Walter Wren, L.C.C., by Mr. T. Howell Williams, F.C.S., one of Mr. Wren's colleagues on the County Council, on the question of the abolition of smoke, in response to a request made by the former gentleman for a detailed account of a scheme propounded by Mr. Williams for the prevention of fog in London. Briefly stated, the scheme consists in the production of gaseous fuel at so low a price that it would be impossible in the future to burn coal economically in London. This would be accomplished by making two kinds of gas at the coal-fields, closely adjacent to the coal-pits; conveying the same, when manufactured, to London in separate systems of main-pipes; storing it in convenient holders; and then distributing it for the two distinct purposes of heating and lighting—thus making it a matter of absolute impossibility that coal should be consumed with economy within the radius of the Metropolitan district for the purpose of heating, and preventing its import as a matter of profit. Mr. Williams divides his letter into two sections, in the first of which he points out the disadvantages ensuing from the present indiscriminate and ill-regulated combustion of coal in the Metropolis, and in the second sets forth the main features of his scheme. Dealing with the evils of the existing system, the author states that the citizens of London have, from early times, been of opinion that the fumes produced by the combustion of coal corrupt the air, and are injurious to public health. Smoke, the inevitable result of this operation, is an element, and a very dangerous one, in the fog with which London is so frequently afflicted in the winter season. During a period ranging from November, 1879, to February, 1880, there was a protracted fog which doubled the death-rate; and in the week ending Feb. 13, 1882, the rate rose, on account of fog, to 35·3, as compared with 27·1 in the previous week. Apart from the injury to health which the use of solid fuel entails, there is the question of domestic convenience; and Mr. Williams points out that its abolition would result in an immense saving of labour, by dispensing with the necessity for cleaning and attending to stoves and grates and sweeping chimneys. He charges Londoners with being wasteful in the matter of both lighting and heating; and he quotes from an article in the *Quarterly Review* to prove that, if houses were scientifically warmed, the saving in labour and the cost of coal, as well as in immunity from sickness, would yield a sum sufficient to provide parks and playgrounds, &c., for the whole Metropolis, and make it as bright and cheerful as it was three-quarters of a century ago. The reform of the domestic fireplace, and the adoption of a more scientific method of burning coal than that now employed, by which at least five-sixths of the heat developed is lost, would, he admits, provide a remedy for the evils he enumerates; but he ventures to submit that they would be entirely obviated by the scheme he proposes, the general outlines of which we give in the author's own words.

He says: I propose that gas should be made at the coal-fields; that it should be manufactured as close to the pit's mouth as convenient; that it should be conveyed from the gas-works, situated in the country, up to the Metropolis in suitable mains; that it should be stored in holders as at present; and that it should be solely utilized for heating and lighting the Metropolis, together with providing all the motive power required for driving engines and machinery. By this it will be possible to obtain the extinction of all the deadly fog of London, and of all the waste already alluded to. That this plan is not unscientific or impossible is, I think, shown by the fact that Dr. Siemens proposed in 1863 to establish separate mains in Birmingham for the distribution of heating gas, to be applied for motive purposes to small boilers and the furnaces of the small factories and for domestic uses. At the present time, when gas-engines are more commonly employed, this heating gas can be used with greater advantage and economy in supplying the motive power for electric lighting purposes, and other schemes which are constantly coming into operation. Siemens intended that the gas should be manufactured in the coal-pit itself. His favourite suggestion was a plan which consisted in placing gas-producers at the bottom of the mines themselves, so that instead of raising the coal to the surface, the combustible gases ascending from the depth of the mine would acquire, by virtue of their low specific gravity, such an onward pressure that they could be conducted long distances in tubes; thus saving the cost of raising and transporting the solid fuel. The present plan is distinguished from that of Siemens by the fact that the gas-works would be placed in close proximity to convenient coal-stores in suitable coal-fields, and not in the pit itself. The latter method would have so many obvious disadvantages that it is unnecessary to explain why it could not be adopted. In the gas-works situated on the coal-fields, in close proximity to the beds of coal, we should have one enormous advantage over the present system of works in London itself. We would dispense with the enormous amount of unsightliness, unhealthiness, and waste of available area which now occur owing to their present position and construction. The conditions which affect the quality and character of the gas would also be greatly improved. The coal used would not be exposed as at present to a long continuation of atmospheric changes, but could be used without much delay after being brought out of the pit. The coal at the time of its distillation would be dry, and not exposed to wet, and the waste in transit would be avoided.

The production of illuminating gas from coal is a simple process, and may be considered as the re-arrangement of the elementary constituents of the coal under the influence of heat. It is well known that nearly the whole ingredients of coal can be so converted. It is also well known that coal can be converted into two kinds of gases which can be easily separated, and the lower forms or qualities may well be utilized as heating gas or gas fuel, while the more brilliant illuminating gas can be used for the general purposes of lighting. The ordinary retorts can be used for the production of both heating and lighting gas; for, during half an hour after coal gas has begun to be given off, the gas is only fit for heating purposes, whereas afterwards, for about two hours, the illuminating gas comes off, and then, when further heat is applied and continued, a very large volume of gas of low illuminating power, but of efficient heating qualities, is extracted. Under the present system, this heating gas is left in the coke, or perhaps sent off late at night to drowsy customers who are unable to perceive or account for the difference in the brilliancy and quality of the light supplied to them. Both kinds of gases can be made more suitable for their distinct purposes by this division; for the illuminating gas is made richer in light-giving properties, and heating gas could, under all circumstances, be burnt without the production of soot and smoke. There is but a small proportion of the total quantity of illuminants in coal gas to the bulk of the materials dealt with; and the public could, if necessary, well afford to pay a slightly advanced price for a gas of greatly increased illuminating power, provided that heating gas at a reduced and economical rate were supplied to them.

There are many inducements to the employment of gas as fuel. There is no fear of engines being stopped owing to lack of water; and there is the absence of danger from boiler explosions. No stoking is required; and the ease with which gaseous fuel can be regulated, the comparative readiness with which cleanliness can be maintained, together with its high heating power, mark out its pre-eminent advantages as a motive power in industrial operations. Costly cannel gas, with its brilliant illuminating power, is no better suited for a gas-engine or for gas-fires than common gas; and, for heating purposes, a greater yield of gas might be obtained, which in burning would evolve more heat than is sought for in making illuminating gas.

Having thus stated the advisability and necessity of dividing the gases, it will be seen that it will be necessary to provide two distinct sets of mains to convey the heating gas and the lighting gas to London from the spot which would be chosen for the establishment and construction of the central gas-works and manufactory; and I now propose to refer somewhat briefly to the question of the mains which would be required. The length of mains from the coal-field gas-works would necessarily be 100 miles at least; and the present system of mains would have to be re-duplicated, in order to convey the heating gas. If any objection is raised as to the impossibility of driving gas through this length of pipe, I can point out that the various Gas Companies which supply the Metropolitan area alone have 4000 miles of mains, which they are constantly working. For my own part, I do not see why it would be more difficult to work the mains from the coal-fields by pressure than it is at present to supply London through this enormous extent of main. Gas-pipes laid through arable land, if it is found desirable to lay them underground, are not harmful to the land itself, but rather do a certain amount of good, as they assist in draining the country. If the joints are perfect, and well puddled round with clay, they will effectually prevent any possible escape of gas.

Illuminating gas suffers, to a trifling extent, by being carried long distances, by the deposit of naphthalene in the pipes in cold weather; but this is again remedied in warm weather by the volatilization of the naphthalene at the higher temperature. This objection would also be reduced if we obtained a richer lighting gas by the separation of the gases. Naphthalene is a valuable product, which might, if circumstances required, be used on the same principle as the albo-carbon lights for enriching gas near the place of consumption, or for converting the heating gas into illuminating gas. The importation of gas in main-pipes in this manner would be far more economical, more cleanly, more convenient, and more expeditious than in the present modes of conveying coal to the Metropolis. If it be objected that an enormous amount of capital would be wanted to invest in the laying down of these mains, one can only point to the capital which is sunk in rolling-stock, in

railway labour, and in local means for the transit of coal, to show how it can be obtained.

A wonderful revolution has taken place in America and the Caspian Sea, in the transportation of petroleum, through the use of what are called "pipe-lines." The cost in this country of petroleum has been reduced about one-half through the introduction of this cheap means of transit from the oil-wells to the coast. The first experiments of these were unsuccessful; and the enterprise met with the most determined opposition from persons who supposed their interests would be invaded by the use of these pipe-lines. But at the present time, the lines not only form a complete network throughout the American oil regions; but there are trunk lines, which extend from these regions to the large cities, such as Pittsburgh, Cleveland, Buffalo, and New York. These lines transport the oil of large areas to those cities under a high pressure; delivering thousands of barrels daily. They are laid for miles through the forest-covered hills and valleys of northern Pennsylvania and southern New York, across hills and rivers, on the surface of the ground, or only slightly covered. These main lines are 6-inch pipes, tested to a pressure of 2000 lbs. to the square inch, and joined with couplings, into which the lengths of pipes are screwed, as are ordinary gas or water pipes.

The pumps used to keep up the necessary pressure are very powerful machines, forcing the oil rapidly through great distances and in vast quantities, not only over the hills encountered in the course of the line, but against the friction of the pipe conveying the oil—an element of vast importance in the problem, when it is remembered that the friction increases enormously as the flow of the oil is increased in rapidity. I need hardly point out here that, in the case of the conveyance of gas, even for long distances, the friction will be incomparably smaller than in the case of driving oil through pipe-lines; and any pressure which may be required will be produced by far less forcible pumps than those now in use in America for similar purposes.

Experiments on the question as to whether or not the illuminating power of gas suffers from travelling for long distances have been made in connection with the gas which travels from the extensive works at Beckton to London; and it has been found that the illuminating power is not appreciably affected. The gas from the Beckton works is supplied in unusually large quantity by a pipe 4-feet in diameter and nine miles long; and there are circumstances in its transit which materially tend to counteract any evil effects from the distance which the gas has to travel. In the first place, the great quantity helps to maintain the conducting pipe at a suitable temperature—thereby lessening the tendency to undue condensation; and, secondly, by lessening the amount of friction to which the gas is subjected. It has been thought also that the adverse influences of distance are fully balanced by the large diminution that occurs in the amount of aqueous vapour.

The capital authorized to be raised by the London and Suburban Gas Companies amounts to £21,500,000. Of this about £17,000,000 are actually raised. Another £20,000,000 at least are invested in rolling stock, in railway sidings, wharves, coal-waggons, horses, and fixtures by those interested in the coal supply. Thus it will be seen that nearly £40,000,000 are now in use, invested in the business in one way or the other, apart from the enormous investments by railway companies in connection with the transit. Assuming that the present plan is adopted, I do not myself see any tangible reasons why sufficient capital could not be easily obtained to construct the new system. We have recently seen, in the prodigious undertaking of the Manchester Ship Canal, how investors are ready to obtain fresh outlets for their accumulating sources of wealth; and it is notorious that whenever there are schemes afloat which are of service and profit to the community, there is generally little difficulty felt in obtaining the capital required to carry them out. The total income, less public lamp charges, of the Metropolitan and Suburban Gas Companies in 1888, arising from gas-rentals, meter and stove rentals, rents, and miscellaneous receipts, amounted to £5,087,942. The net profit of these Companies in that year was about £1,600,000; and they paid about £210,000 in rates and taxes. This represents, of course, only the side of the question relating to gas manufacture. It is difficult to arrive at the actual amount of profit obtained by the coal retailers, all of which would be saved by having London lighted, heated, and worked by gaseous fuel. For the enormous amount of capital which is at present invested in gas-works, in mains, in the undertakings of the London Companies, and in the railway stock and gear which it is necessary to use, it would be exceedingly easy to reconstruct on a scientific and satisfactory basis, the whole of the lighting and heating arrangements of the Metropolis.

There remains one other consideration in this scheme which presents, I confess, most difficulty. It is the question of the coal-fields, where the gas is to be manufactured. The coal supplies of this country are supposed to be rapidly coming to an end; and it has been prognosticated that the day is not far distant when the supremacy of this country will be seriously affected by the termination of her coal resources. One result of adopting the plan of supplying London with gaseous fuel will be the great economy of coal resulting from its consumption not being required, or reduced to a minimum, in the Metropolis. The estimates formed of our coal supplies are, however, probably too low, and we find, for instance, in South Wales at the present time, fresh sources of coal being opened in many places. The coal-field which is nearest to London will be that of North and South Staffordshire. The field which it would probably be most useful to select would be either this district or that of South Wales. The only question would be that of additional expense for laying down main-pipes; and, while recognizing this as a serious item, one must also remember the corresponding advantages to be derived. I think that if once this principle of removing gas manufactories to the more suitable locations of the coal-fields is adopted, the difficulty of selecting the field will be easily overcome. The expense need not frighten us; and the saving would, in the long run, be so enormous and far-reaching that the initial cost could not be prohibitory. The experiments which have been tried at Manchester, by removing mills into the country, will be repeated here on an immense scale; and the ensuing benefits will be relatively enormous. Capital being easily procurable, there can be no reason why we should not do for London in gas what the enterprising Liverpool Corporation have done for their town in bringing the more difficult element of water from the wilds of North Wales.

In commencing this statement, I endeavoured to summarize the manifest inconveniences (or some of them) attendant upon our present system of coal consumption in the Metropolitan area. I have also attempted to show upon what lines the reform of that system should, in my opinion, be carried out. The confessed inability of our authorities in dealing with the serious questions before us is due to one great fact—they do not care to face the storm of criticism which must come upon the heads of those who interfere with branches of industry which have become settled sources of livelihood and remuneration. No remedy for fogs and for the winter miseries of our climate can ever be suggested which does not go to the root of the matter. Nothing can ever be done in alleviating the pains and penalties of our present system which does not leave coal burning out of the question. Free from mist we can never be; but surely it is not too much to hope and to strive for freedom from that black canopy which so frequently deadens the life and lights of London, and which imposes such fearful burdens upon the community. Some amount of mist will, of course, be present under the best conditions; but it is quite possible to rid that mist of the pernicious ingredients resulting from the indiscriminate use of coal in our fires. Some maintain that fogs are good, inasmuch as some of the products of the combustion of coal in the air exercise an antiseptic and disinfecting influence; but, notwithstanding this slight and doubtful advantage, it is certain that whatever degree of purification of the air may be reached in our large towns, there will probably be enough left to exercise this questionable effect. What we have to get rid of is the smoke, which is the dangerous element in the comparatively innocuous mist. There seems no valid reason why our domestic fires should not be supplied by gas in the way which has already been indicated. During the past few years, the marked improvements in gas stoves, ovens, heating apparatus, and open gas-fires have been so great that we can be said to be only at the threshold of its development as a heating agent. This is the only method by which we can secure smokeless chimneys; and these smokeless fires and economical grates would do away with the present smoke. The advantages of gas-fires and stoves are now thoroughly established, and have been well set forth and illustrated by Dr. Carpenter, Mr. Fletcher (of Warrington), and others. It only requires inspection of some of the various modern gas-stoves in use to prove that they are in every way as pleasant, cheerful, and comfortable as the present dirty fires. By this means, the products and equivalent of coal for heating and lighting purposes would be brought to London at a cost of about one-tenth of the present expense of transit.

By the plan suggested, an immense amount would be saved even in the price of gas itself. It would be safe to say that gas could be reduced to one-half of its present cost; and thus we should have a cheaper, a cleaner, and a more efficient mode of heating and lighting hitherto denied to us. There would be the saving in health and comfort, in public resources, and in the economy of precious time and money. We should have a cloudless sky and a healthy atmosphere, and should stand a better chance of perceiving the rays of the sun than at present. There would be the prolongation of life and the incalculable additions to comfort and ease. Beyond these also we could obtain for the poorer classes benefits of a kind which they would appreciate directly. We could procure a more sanitary and cleanly state of affairs in their homes; and this is no small gain when their normal condition at present is considered. We boast of our wealth, our science, our freedom, our powers of combined exertion, our sense of cleanliness. We glory in our civilization; but our glory will become a shame if the present wasteful system is continued.

Even if it were necessary that a vast stock of unused capital should be expended to bring about the reform, I think it would not be money ill spent. Not that I agree for a moment that the present capital would be destroyed. It would only be diverted into new channels, just as when gas was introduced into this country, and when towns were first illuminated by it, the old musket barrels, laid by in quiet retirement after the fatigues of the great Continental wars, were employed for its conveyance in lieu of pipes; and, by a remarkable coincidence, various ironfounders desisted in a great measure from the manufacture of iron ordnance, and took up the peaceful employment of casting pipes for gas and water. There would be on the asset side the priceless boon of a healthier and more comfortable people. Besides that we could point to the saving of at least £6,000,000 per annum in carriage and distribution and domestic labour; putting aside the question of depreciation of property. If we could total up the fairest estimate of the approximate money waste occasioned by London fogs in the course of a single year, it would be expressed, no doubt, in terms of millions sterling; and no plan should be set aside without due and reasonable consideration, if it presents some practical scheme of reform. The question of expense, of the raising of capital, is in reality not the most formidable. The existing prejudices and the national sentiments of English people in favour of the present English fire, are stronger obstacles to a thorough eradication of the smoke evil than the obtaining of the necessary capital. One does not see why the cheerful fire will not be perpetuated in the equally cheerful, but far more convenient and cleanly gas-fire which would be introduced in the new era. Something must be done; and I am certain that when it comes to be done, it will be found to be in the direction I have endeavoured to point out in this letter.

The Belgrano (Buenos Ayres) Gas Company have declared an interim dividend of 3½ per cent. for the six months ended June 30.

Water Mains and Hydrants in the Metropolis.—In his last annual report to the Local Government Board, Major-General Scott states that the number of miles of streets containing water-pipes constantly charged in each Water Company's district within the Metropolis is as follows: Chelsea, 76½; East London, 185; Grand Junction, 84; Kent, 154¾; Lambeth, 156½; New River, 291; Southwark and Vauxhall, 160; West Middlesex, 114—total, 1221¾ miles. During the past year the work of erecting hydrants for fire extinction made considerable progress.

THE EDINBURGH INTERNATIONAL EXHIBITION.

As mentioned in the JOURNAL last week, the awards of the Jurors at the Edinburgh International Exhibition of Electrical Engineering, General Inventions, and Industries have been issued. Though the exhibition was specially designed to promote the cause of electric lighting, it has been matter of general comment that gas is used to an extent much greater than in the Edinburgh Exhibition of 1886. All the entrances are lighted by gas, burned in regenerative lamps; gas is constantly alight in all the galleries and courts after dark, to take the place of the electric light if it should fail; and many of the exhibitors have laid on gas to supplement the electric lighting. The latter arrangement is specially noticeable in the foreign courts, where an ordinary gas-burner is found more suitable than the electric light for the display of jewellery and glass-work; and also in the furniture sections, where it gives a home-like appearance to arrangements of suites of rooms. In the Indian Section, too, the exhibitors find that the warm gaslight shows off their bright-coloured goods to better advantage than the public arc, or even a private incandescent lamp would do; and the section is nearly wholly lit by the Thomas regenerative lamp, which gives a good light, and, being handsomely fitted, looks well. The "Radiant" regenerative gas-lamp has been fitted up by Messrs. A. Clark and Co., of Picardy Place, Edinburgh, on several furniture stands. Besides these, the public have been treated to a comparison between electric and gas lighting by Messrs. J. Stott and Co., of Oldham and London, who have erected one of their large Stott-Thorp "Reflex" lamps in the centre of the machinery hall. A worse place, so far as gas is concerned, could not have been chosen for its display, because it is directly over the enclosed area where the electric light dynamos are situated, and where the electric lighting is most powerful. On the other hand, the selection of so disadvantageous a position made it patent to all that the exhibitors sought no favour to which they were not able to establish a claim. Their lamp is a large and finely-finished article, with 56 burners, which give out a light equal to 1400 candles. As it is situated in the neighbourhood of at least six arc electric lamps, each of nominally 2000-candle power, its lighting effect cannot be appreciated. There is a superabundance of light at the place; and all that can be accomplished by the observer is a comparison of appearances, which is certainly in favour of the gas lighting. Since it was erected, it has been inquired after by theatrical managers and others who have been struck by its brilliancy as well as by its cleanly appearance; there being no sooty deposits on the reflectors. The latter is a great point in favour of the lamp, because a sunlight in the centre of the ceiling of a large apartment is scarcely accessible for purposes of cleaning. In the "Reflex" lamps, as is known, the cone of the reflector is closed, and consequently there is no upward current; the heated air being compelled to find vent round the bottom edge of the cone. The high temperature of the cone prevents the deposit of soot upon its interior, which thus preserves its original whiteness; and the downward current of hot air serves, in addition, to keep the flames horizontal, and thus to increase their light-giving property. These are what may be termed the public exhibits of gas; but besides them there are a considerable number of ordinary exhibits, nearly all of which have obtained awards.

Messrs. Crossley Bros., Limited, have obtained the highest award—the diploma of honour—for their "Otto" gas-engines. Their exhibit is a large one; consisting of twelve engines ranging from 2-man to 14-horse power nominal. The engines are fitted with the firm's new arrangement for igniting the charge by means of an iron rod kept at a red heat by means of a Bunsen burner. By this plan a slide-valve, which required frequent cleaning, is done away with. One of the engines on the stand—a 5-horse power—is employed to drive an Elwell-Parker dynamo, which feeds 50 incandescent electric lamps, of 16 candle power each, on the stand; and a 500-candle power incandescent lamp is supplied with electricity from a dynamo driven by a 10-horse engine. In both cases the steadiness of the light testifies to the capabilities of the engines to maintain a high speed with perfect smoothness and regularity.

The "Stockport" gas-engine, shown by Messrs. J. E. H. Andrew and Co., Limited, of Reddish, has obtained a gold medal in the complimentary list, for a 16-horse power, double-acting engine which has been employed in generating electricity for the electric railway. The engine is a beautiful specimen, valved on the new principle of the "Stockport," which is celebrated for the simplicity of its working parts. The valve-gear is simplicity itself; but it works with perfect regularity, and enables a speed of 160 revolutions per minute to be attained with some of the lighter engines. Messrs. Andrew and Co. also show, on stand No. 135, in the machinery hall, the "Stockport" engines at work; one of 6-horse power driving a Blackman air-propeller, and another of 3-horse power, driving a dynamo.

Messrs. Fielding and Platt, of the Atlas Iron-Works, Gloucester, have been awarded a gold medal in the general class for their patent gas-engine, which is exceedingly simple in its working parts; having no slide or ignition valve, and only one valve under pressure. The engines shown are a 4-horse horizontal and a 1-horse vertical.

The "Griffin" gas-engine is shown by Messrs. Dick, Kerr, and Co., Limited, of Kilmarnock, and has been awarded the silver medal. This engine is very popular in Scotland; but it does not seem to have recommended itself to the Jurors. Its characteristic is an explosion at both ends of the cylinder, which gives it a high brake power. A 12-horse nominal engine of the firm is employed by the Exhibition Executive to drive the line of shafting on one side of the machinery hall; providing power for all the printing, &c., machines. They show engines of various powers, and have several at work on different stands in the exhibition. A feature of the "Griffin" engine which enables it to attain a high speed is the oil supply, which is taken in according to the explosions, and provides sufficient lubrication to allow of a very high speed being maintained.

Coming now to appliances connected with lighting, the Thomas Lighting Company, Limited, of Carthusian Street, London, have been awarded a silver medal for their regenerative gas-lamps. The Incandescent Gas-Light Company, Limited, light the large stand of Messrs. Burroughs, Wellcome, and Co., manufacturing chemists, of London, by means of 28 lights on the Welsbach system; and for this they have been awarded a silver medal. The lighting of the stand is very efficiently performed; the presence of the electric light in the gallery not by any means detracting from the effect. Messrs. J. Stott and Co., of Oldham and London, have been awarded a silver medal for their gas-governor, and the "Reflex" light already mentioned. Messrs. A. Gardner and Son, of Jamaica Street, Glasgow, who are furniture manufacturers, show a large stand of house furnishings. They are also, our readers may remember, proprietors of the patent "regenerative" globe cover for gas-lamps, which has been described in the JOURNAL; and their stand is very beautifully lighted by lamps provided with these covers. A silver medal has been awarded to them for both their furniture and the "regenerative" cover. The latter consists of an asbestos ceiling fitted upon the globe, which has the effect of greatly increasing the illuminating power of the light.

In gas stoves and heating appliances, Messrs. Charles Wilson and Sons, of Leeds, make a fine show with their improved gas-stoves, and have been awarded a gold medal. Messrs. J. Greenall and Co., of Manchester, have been awarded a bronze medal for their "Marsh-Greenall" gas-stove. Mr. W. G. Cannon, of Southwark, London, has obtained a bronze medal for radiating warming apparatus which can be used with either steam, hot water, or gas. Mr. T. Frater, of Edinburgh, and Mr. J. Greenall, of Manchester, have each obtained a bronze medal for gas-heated washing-machines. Maughan's Patent Geyser Company, Limited, of Queen Victoria Street, London, have obtained a silver medal for their instantaneous water-heater. The Company also show their "Sun-Ray" stove, for gas or oil; but for this they have not received any award. The "Thermodote" automatic gas water-heater, shown by Messrs. Isaac Braithwaite and Son, of Kendal, has obtained a silver medal. Whenever water is drawn, the "Thermodote" turns up the gas, which then burns until a certain temperature of the water is attained, when it turns it down again.

Mr. J. Keith, of London, Edinburgh, and Arbroath, obtained a gold medal for a variety of appliances, among which is included his patent mineral-oil gas-works. Mr. Keith's apparatus is employed by the Commissioners for Northern Lights to manufacture gas for lighthouse illumination, having been adopted by them after an exhaustive trial. Messrs. Edwin Mansfield and Son, of Manchester, have been awarded a gold medal for Mansfield's improved patent oil-gas apparatus, which is small and compact, and is both easily worked and economical. Messrs. D. Grant and Co., of Edinburgh, have obtained a bronze medal for wet and dry gas-meters.

The foregoing exhaust the awards to exhibitors of gas appliances. A number of exhibitors, however, did not submit their goods to the Jurors. Among these were the following:—

Messrs. R. and J. Dempster, of Newton Heath, Manchester, showed their patent automatic electric indicator. This appliance is intended to indicate in the engineer's office the rise or fall of gasholders, water reservoirs, &c., at a distance. It is a simple and useful contrivance, and will doubtless prove of great value. As the float on the surface of the water or other fluid falls, it unwinds a cord upon a drum, causing it to revolve. At each turn of the axle, a projection upon it strikes a small upright pivoted bar, driving it to one side, and making an electrical connection, which, by an ordinary magnetic appliance at the other end of the wire, pushes a cog-wheel forward, and moves round the hand on the index. When the action is reversed, and a rise takes place, a spring winds up the drum, and the projection on the axle drives the pivoted bar to the other side, making a connection with another battery. The effect is to bring another magnet into play; and the cog-wheel of the indicator is pushed by it in the opposite direction from what it was when a fall was being recorded.

The Dinsmore Gas Company, Limited, of Liverpool, show a model of the apparatus used in the manufacture of gas by the Dinsmore process. It is a pity this apparatus was not adjudicated upon. The Company, however, distribute literature which states the good results which are derived from the process as employed at Widnes.

Messrs. Stephenson, Clamp, and Co., of Hull, showed their patent self-acting gas-governor and gas-burners. This firm has an Australian connection.

Messrs. Pitkin and Niblett showed their mercurial coal-gas detector, but were disqualified in respect of their being makers of electrical fittings and apparatus, for which there are no awards. The apparatus depends upon the property which mercury possesses of rising in an atmosphere of coal gas; and the rise is stated to be proportional to the explosive activity of the gaseous mixture.

Besides these there were several gas exhibits which did not obtain an award, among which were the Fourness regenerative gas-lamp, shown upon the stand of another exhibitor, and not mentioned in the catalogue; and the "Champion" perfect combustion gas-lamp, shown on the stand of Messrs. Baird, Thomson, and Co., of London and Glasgow. The latter firm obtained a gold medal for ventilators; but the lamp was not scheduled.

It will thus be seen that practically everyone who exhibited gas appliances obtained an award of some sort; and this is a feature of the exhibition generally which has given rise to a great deal of comment.

Large Sale of Cardiff Gas Stock.—Last Saturday week, Mr. Lewis Gottwaltz offered for public sale at Cardiff, £12,500 of ordinary "D" stock, in lots of £100 each, in the Cardiff Gaslight and Coke Company, bearing a maximum dividend of 5 per cent. per annum, pursuant to the Cardiff Gas Act, 1887. There was a good attendance. The bidding was very brisk and spirited, and in a short time the whole of the lots were disposed of. The lowest price realized was £102 per cent.; the maximum being £103. The average price was £102 15s.

Launceston Water Supply.—The Launceston Town Council, at their meeting on Monday of last week, resolved that at the earliest opportunity they would provide an additional storeage of water for the town, either by enlarging the present reservoir or constructing a new one. In the course of the discussion, it was stated that the present reservoir was scarcely worth the name; and that, under existing conditions, if there was a dry summer or a fire, the town would be left in a sorry plight. A Committee was also appointed to ascertain and report upon what terms land and water rights could be acquired.

THE STRIKE OF GAS STOKERS IN MELBOURNE.

Narrative of an Eye-Witness.

In the JOURNAL last week we gave a general account of the recent strike of gas stokers in Melbourne. Just as we were going to press, we received from an esteemed correspondent, who is connected with one of the neighbouring gas undertakings, a letter furnishing some particulars of the occurrence. Although his story does not differ, in its main features, from the one told in our columns, it possesses interest as being the narrative of an eye-witness of the various phases of the strike; and we therefore reproduce it.

As many of us out here read with great eagerness, over our morning meal, the cablegrams from the Old World relating to the remarkable battle fought by Mr. George Livesey with reference to his profit-sharing scheme, and the still more recent fights at Manchester, Salford, and Leeds, we little thought we should so soon be in the midst of a still more terrific struggle in this so-called "land of sunshine and gold." The small cloud—"little as a human hand"—first seen on the horizon, has now "spread along the skies," and expanded till it "hangs o'er all the land," and every trade is enveloped in darkness.

The first signs of the struggle were observed when the Trades Hall objected to the dismissal of a seaman from the S.S. *Corinna*, and demanded his reinstatement. This being refused, all the crew were called out. The next important movement was made by the Marine officers, who, not content with demanding reduced hours of labour with increased pay, affiliated themselves with the Trades Hall, of which the Seamen's Union form a part. But the steamship owners, while willing to meet their views on the first point, resolutely declined to give way on the second; as they held that the officers' connection with a Trades Union would be detrimental to all discipline, and consequently dangerous to life and property. The other side, however, would not yield; and as each steamship arrived alongside the wharf, the officers came out in a body. Then the Seamen's Union—almost gladly, as it appeared to me—joined in the strike; and they were quickly followed by the wharf labourers.

The next important move was one in which your numerous readers are more or less interested—viz., that of the gas stokers. The Melbourne Gas Company's coal had to be discharged from the steamers alongside; and there was no help for it but to employ non-Union labour—or "free" labour, as it is more familiarly called here. But that coal formed a great difficulty to the Union men inside the retort-house. It was as the accursed thing; they might not touch it and live—within the Union. And this brings me to the finest point of etiquette that has been observed during the strike. The Union stokers resolved that, though they could not shovel the coal into the retorts, they might shovel it out of the way! Eventually, however, finding that the Company still persisted in discharging coal with free labour, the Trades Hall stepped in, and called out the gas stokers. Then the "tug of war" began; for the whole of the events to which I have referred happened in so short a space of time that the Company were unprepared for the sudden climax. But with Mr. John Benn as Chairman, and Alderman Mowbray as Vice-Chairman, ably supported by their colleagues on the Board, together with officers like Messrs. Vasey, Wynne, and Thompson (who have won "golden opinions" from the public), there was "no such word as 'fail.'" They immediately advertised the colony over for efficient gas stokers at £1 per day; and although at first the response from the right class was very indifferent, yet with the splendid aid given by the office employees, who worked with a will, and the assistance rendered by the Manager of the Australasian Gas Association's works at Box Hill and Surrey Hills, and the Managers of Foot's Cray and other gas-works around Melbourne, who all brought contingents of good men, they have managed to pull through the crisis extremely well. It is true the pressure of gas was considerably reduced, and for two days the supply was cut off altogether; but as I write to-night (Sept. 8), the light is very satisfactory, considering that the new hands taken on have had to be taught in so short a time. They are being housed and fed in the works; and although they were a little troubled at first by the Unionists, the Government took a firm stand, and issued proclamations, coupled with the calling out of the military. The result of these measures is that all is now comparatively quiet. I am truly sorry for the old stokers, who were, as a rule, a fine body of men; and I know that many of them left their work with great reluctance.

It is an open secret that this strike of gas stokers was to be the trump card of the Trades Hall; but so far it has proved a complete failure. I think I can safely say that the public sympathy is with the shipowners and the Gas Company; for it is worthy of note that not a word of complaint has been heard against the latter for the inconvenience occasioned—in fact, they have received offers of help, as stokers, from nearly all classes, including the students in the University. I could relate many curious instances of men who presented themselves as would-be stokers; but one example will suffice. A smart, fine-looking man, got up rather as a dandy, with shiny bell topper, tempted by the pound a-day, applied to Mr. Wynne for employment as stoker; stating that he was a barrister not long out from England, but had been unable to get anything to do. Mr. Wynne politely informed him that he was scarcely the class of man the Company wanted, and that, in fact, he could not think of putting him on to such work. The poor fellow left with a dejected air; but I feel sure that such as he who are anxious to get work, however menial, will not remain idle for long. We have too many of the other class—young men known here as "Wasters"—who are sent out from England to "turn over a new leaf," but who more often go from bad to worse.

Perhaps the most remarkable meeting ever held in Melbourne was the one that took place a few days ago in the Athenæun Hall, which was crowded to the doors (all classes of employers being present), when Mr. James Huddart, a large ship-owner, stated the case with great force on behalf of the steamship-owners of Australasia. All his references to the Trades Hall dictation were most enthusiastically cheered; and the meeting was entirely with him. I felt, as I sat and listened, that he was battling with himself to keep back strong words which ever and anon struggled to the surface, and that the old Jingo political song would possibly best have expressed his pent-up feelings:

"We don't want to fight; but, by Jingo, if we do,
We've got the ships, we've got the men,
We've got the money too!"

But the speeches of Messrs. Huddart and M'Lean, as well as all the rest, were wise, because they were moderate in tone; yet they showed that the speakers were thoroughly determined to put down boycotting and intimidation. One speaker (Mr. Mair) "brought down the house" by stating, at the close of his speech, that the time had now arrived when they must put their hands on the shoulder of the Trades Hall Council, and say calmly, but with irresistible force, "Thus far shalt thou come, but no farther." This meeting was followed the next Sunday afternoon by a great labour demonstration, when about 40,000 people attended. Addresses were delivered by Mr. John Hancock, one of the chief leaders of [the Trades Hall (of whom I entertain a very high opinion, for his ability, and a still higher one for his character), together with Messrs. Trenwith, Murphy, and Champion—the latter of London Socialistic fame. Their remarks dealt chiefly with the speeches made at the Employers' Union meeting already referred to. Mr. Champion (to his credit be it said) has given utterance to sentiments which are not in accord with Trades Unionism as practised in the Colonies—viz., that coercion or interference with a man's freedom of action is carrying Unionism a little too far.

The calling out of the military, and the bringing down, from the up-country or Bush townships, of mounted police to assist in keeping order, led to a very interesting debate in Parliament. I cannot refrain from giving your readers a portion of the speech made by the member for Central Melbourne (Mr. G. D. Carter), which literally convulsed the House, and interfered with business for some time. It only shows that so serious a subject as a great labour strike may, in the language of the Mikado, be made a "source of innocent merriment." The part of the speech to which I refer was as follows:—

Mr. G. D. CARTER said he happened to be the representative of the seat of war. The action of the Government in calling out the military had been denounced; but what had taken place during the last few days justified that action. The very food that was sent to the gas-works for the men working there had to be protected by the police while it was being carted through the streets of the city. The butcher and baker who supplied the caterer were threatened to be boycotted; and many instances could be quoted to support the course pursued by the Government and to show the necessity of it. At the mass meeting on the previous Sunday, there were three sections. One section stated that the Trades Hall were making use of the working classes for their own ends; and the honourable member for Richmond [Mr. Trenwith, the Trades Hall representative] was accused of climbing into Parliament on their backs instead of providing food for the unemployed, and of exciting class against class. [Mr. TRENWITH: A very improper proceeding.] Yes; it was a highly improper proceeding. ("Hear, hear," and laughter.) A further section wished to burst up the capitalists and everyone else. (Laughter.) However, they seemed to forget that capital was evenly distributed in the colony; and anyone who wished to create a disturbance would not only have to meet the military and the police, but the majority of the people. (Cheers.) If the Government had not taken the steps they did, the citizens would have appointed Vigilance Committees, who would have made short work of those who incited people to commit thefts and indulge in violence. He did not know if the honourable member for Richmond believed in a hereafter; but, if he did do so, he would, like all of them, wish to get into Heaven. When the honourable member reached the golden gate, what would happen? (Laughter.) When St. Peter opened the gate and saw the honourable member, he would refuse to let him in, because if he once got into Heaven he would prevent anyone else coming in who was not a trade unionist. (Laughter.) Well, the honourable member would have to go somewhere; and, having no alternative, he would have to go to the "other place." (Loud laughter.) When the Devil saw the honourable member, however, his satanic majesty would exclaim, in tones of alarm: "For goodness sake, don't let Trenwith in here; he will be calling out all the stokers." (Loud laughter.)

Those remarks were, perhaps, a trifle irreverent; but they nevertheless tickled the fancy of the House, and were the talk of Melbourne for several days.

To sum up this long and rambling letter, let me add that by the time you receive it the battle may be over, and the victory won; but on which side, who will venture to predict? Both sides are fighting for heavy stakes. The employers and the Gas Company want to employ and discharge whom they please, be they Union or non-Union men. The Labour Unionists wish to prevent this—holding that it will give nearly the death-blow to their Society. We are all hoping, however, whatever may be the end, that we shall have peace for many years to come. It seems to me at present, judging from the firm attitude of both parties, that the conflict will be longer and more severe than many people imagine. The temper of some of the employers towards the Trades Hall might truly be summed up in the memorable words used by Lord Dalhousie on a political occasion many years ago: "We want peace, and have laboured for peace; but if you want war, war you shall have, and with a vengeance." I trust that peaceful counsels may prevail, and that this unfortunate business may sooner terminate than at present appears likely; for just as I am about to dispatch this letter, it is announced that the whole of the Silver Mines at Broken Hill have been closed for want of coal, and about 7000 men are thus thrown out of employment.

LEEDS GAS-WORKS MANAGEMENT.

In the *Yorkshire Post* last Friday, there appeared a letter signed by "W. B. S." in which the management of the affairs of the Leeds Corporation Gas Department was criticized. The communication is rather interesting, and reads as follows: The return issued the other day of the cost of the late gas dispute [*ante*, p. 804] is not very pleasant reading for the heavily-taxed ratepayers of Leeds. The imported men must have fared sumptuously; for although the lock-out only lasted four days, the ratepayers have got to pay £801 14s. 2d. for "food, beer, and tobacco for men engaged at the works and at the Town Hall," while a little trip to London and Manchester, undertaken by Alderman Gilston, the Town Clerk, and Deputy Town Clerk, cost the modest

sum of £20 15s. 1d. The total cost of the lock-out is stated to have been £3096 15s. 4d. This sum does not at all represent the loss to the ratepayers of Leeds; for in all places where gas-engines are used, work was brought to a standstill, and thousands of men, women, and girls were deprived of their ordinary earnings. If we add to this the loss sustained by the masters, the lock-out must have cost the town from £12,000 to £15,000. By an ingenious manipulation of figures, the Borough Accountant makes it appear that, as the result of the dispute, we shall annually gain £5890! If this is correct, I would advise the Gas Committee to lock the men out quarterly until the cost of producing our gas ends like a squirrel track—"up a tree." Doubtless the "estimated benefit" will be about as reliable as the official returns of the illuminating power of the gas, which are a series of twelve monthly frauds per year. The cost of the lock-out is trifling in comparison with the loss to the town by the contractors being allowed to supply the Gas Committee with inferior coal at first-class prices. Incredible as it may appear, the following figures are taken from official records, and show the extent to which the long-suffering ratepayers have been "bled" during the five years embraced in the return:—

	Coal contracted for. Tons.	No. of Contractors.	Inferior Coal supplied. Tons.	No. of Contractors.	Loss to the Ratepayers.
1884	194,000	24	154,000	15	£4,801 5 8
1885	166,000	18	130,000	17	4,657 11 6
1886	149,000	19	71,000	8	1,461 4 5
1887	264,000	24	102,000	10	1,811 11 6
1888	204,000	25	112,000	14	2,012 2 6
	977,000	110	569,000	64	£14,743 15 7

This gives a yearly average loss of £2948 15s. 1d.! What a happy hunting-ground Leeds must be for the coal-contracting "Jeremy Diddlers." We are further informed that in 1884 the loss under one contract was £946 17s. 6d.; in 1885, £751 10s.; in 1886, £414 15s.; in 1887, £402 10s.; and 1888, £456. I wonder if any member of the Gas Committee would, in his own private business, have allowed such a state of things to exist for a single week. Well might Alderman Spark say that "there was a vast amount of trickery going on in the gas-works of the borough of Leeds. He would undertake to prove that when the testing was being made, by means of a pipe which they had got there, they were able to turn on gas of another quality." This statement has never been refuted; and if Alderman Gilston or any member of the Gas Committee will contradict it, I will point out within a yard where such a pipe can be found. At the York Street works the hole on the top of No. 5 gasholder was enlarged at the latter end of 1888. Why? I will allow Alderman Spark to answer the question. He says: In response to the demand made upon the Gas Manager to turn out large quantities of gas, irrespective of quality, large quantities of gas had been made after a fashion, and after being registered were blown off into the air, being too bad to be used!" This explains why the leakage in Leeds gas amounts to 3d. per ton of coal, as against 2d. in other towns, representing a loss of £10,000 a year.

THE WATER-GAS EXPERIMENT AT HARROGATE.

In the JOURNAL last week, a summary was given of some correspondence which had appeared in the *Leeds Mercury* on the above subject. The last letter noticed was written by someone under the pseudonym "Coal Gas;" and the aim of his communication was to show that the remarks of Mr. Wesley Petty in a previous letter, as to the cost of coal gas, were erroneous. To this Mr. Petty has since replied as follows: "The figures quoted by 'Coal Gas' respecting cost of same in Harrogate are misleading. He has evidently, like myself, obtained a copy of the published analysis of the Harrogate Gas Company's account for 1889; and therefore is able to obtain all the information necessary to prove or disprove my statement. But instead of doing this, he deliberately takes the wrong set of figures. In the said paper there are two columns of statistics; one showing the results per 1000 cubic feet of gas sold, the other of gas made. My calculation is from the latter. He draws a red herring over the trail, and takes the column of gas sold; arriving, of course, at an opposite result. I am convinced he is not writing in the interest of gas shareholders as he avers, and that if he will drop his *nom de plume*, we shall find 'Coal Gas' to be in the employ of water gas. Until he does so, I have nothing more to say." Respecting the second letter, by "A Harrogate Ratepayer," Mr. Petty says he seems bent on having the last word on water gas; and he continues: "I have clearly shown the water gas plant to be a serious nuisance to the locality, the comparison unfair in point of gas consumed, and the cost almost double that of coal gas. The only point at issue (if any) is my authority in quoting the cost of water gas. If 'A Harrogate Ratepayer' is now empowered to say that the representative of the JOURNAL OF GAS LIGHTING (who viewed the water-gas plant, and received his entire information from their officials) had not that information given him, they must settle it among themselves. There seems plenty of mystery, and an absence of any standard as to the cost of making water gas under the various processes. Forthcoming actions between the various patentees will probably throw a little light on the subject. In protesting against misleading statements about water gas, I have had only one purpose to serve, and that has been a public one. I have no private interest in coal gas or water gas. I am not a stickler for vested interests, but belong to the party of progress. If water gas had in it the elements of permanent success, it would be for the public good, and a consolation to those who have unfortunately been induced to invest their money in it. If not, it is right to sound a note of warning. It says little for water gas that its defence should have to be undertaken in an anonymous manner."

The representative of the JOURNAL who visited Harrogate last August with the object of furnishing an unbiassed report from personal observation, on the water-gas experiment, and whose statement as to the cost of the gas has been called in question by the "Harrogate Ratepayer," has written to us as follows:—

I see in your columns extracts of correspondence, *pro* and *con*, on the subject of my article on the water-gas experiment at Harrogate. It is only necessary that I should repeat that I went to Harrogate unfettered by any prejudices as to water gas. In interviewing the authorities of the British Water-Gas Syndicate and the Harrogate Gas Company, I made it my special business to let both parties clearly understand that I should not be influenced by either, but should obtain independent opinion, and report on all sides of the question. I went so far as to state that, if there was anything in water gas as a lighting agent, the JOURNAL OF GAS LIGHTING would be bound to acknowledge its value, and proclaim it to the world. My ideas were that it would be folly for those associated with the coal-gas industry to turn their backs on, and decry any new departure, if the public were to be the gainers by such departure. If water gas was really to be the foe to combat successfully with electric lighting, well and good; and the sooner gas companies recognized it, the better for all. Thus did I write upon the Harrogate water-gas experiment. Now I write again, without knowing who Mr. Wesley Petty, "the Harrogate Ratepayer," and "Coal Gas" really are; in fact, it is unimportant to the matter at issue. What I do know is that when the "Harrogate Ratepayer"—it may be Mr. Samson Fox himself—says of Mr. Petty (because he stated his authority for his figures to be the JOURNAL OF GAS LIGHTING) that he was therefore "a tool in the hands of the enemies of water gas," I came to the conclusion that he attacks my *bona fides* as to independent opinion. The same correspondent also asserts that no such figures as 1s. 4d. per 1000 cubic feet, as being the cost of water gas at the point of the burner, was given me by the water-gas authorities. I can only say that if I have mis-stated the figure I am very sorry. On referring to my note-book, however, I find that, in questioning Messrs. Teesdale and Roberts at the Harrogate works, they first of all quoted 10d. as being the cost. I reminded them of the magnesia combs only lasting 40 hours, instead of 100 hours as published; and that whilst the Harrogate experiment was going on the combs were changed sometimes every day. This they admitted; and they further acknowledged that, as the Harrogate works were on a small scale, the cost was 1s. 4d. per 1000 feet, if not more. They said if larger quantities of water gas were produced, the cost would be less. Now, I went to report *facts*, and I could not very well say that the Harrogate water gas was costing 10d. per 1000 cubic feet, when it was really costing 1s. 4d., if not more. Fortunately, I had a friend from Leeds with me at the time of the interview; and he, no doubt, will corroborate my notes. If I were to speak out what I think, the cost of lighting Parliament Street, Harrogate, would be nearer twice 1s. 4d. per 1000 feet. But, of course, this is only opinion. What I am certain of is that if all the expenses (exclusive of plant) of lighting, and of *demonstrating* the beauties of this new illuminant, during the last three months were fairly stated, it would be nearer £10 per 1000 feet, by which I mean to aver that the British Water-Gas Syndicate has spared no expense to put out the light of coal gas at Harrogate. All is fair in war, I admit; but the public must read between the lines. I can only repeat what I said last August—that if the cost of water gas is really such a nominal sum as is stated, the British Water Gas Syndicate should give public guarantees to gas companies and corporations that they will produce their new lighting agent for a term of years at the specified price.

THE DUBLIN CORPORATION AND THE GAS COMPANY.

The Transfer of the Public Lighting Plant.

On Monday, the 6th inst., an arbitration was commenced at Dublin in regard to the price to be paid by the City Council to the Alliance and Dublin Consumers' Gas Company for the public lighting plant in the City. The Arbitrator for the Company was Mr. H. E. Jones, of the Commercial Gas Company, and for the Corporation, Mr. R. Hamilton, Superintendent of Public Lighting at Glasgow. Mr. R. Mitchell, the Engineer of the Edinburgh Corporation Gas-Works, was the Umpire. Mr. Kenny, Q.C., and Mr. Martin Bourke appeared for the Company; and Mr. M'Sheehy, the City Solicitor, represented the Corporation. The proceedings were conducted in private; but a brief outline of what took place has been published. After the opening statement by Mr. Kenny, Mr. W. F. Cotton, the Secretary and Manager of the Company, was examined to prove that the sum asked for the plant (£16,777) was a reasonable one. His evidence occupied the whole day. On Tuesday, Mr. Cotton was further examined. He stated that on some portion of the plant he should allow a small percentage for depreciation, and this further reduced the price. Mr. William Sugg, Mr. Z. A. Berry, Mr. George Anderson, and other witnesses were also examined in support of the case of the Company; their evidence being to the effect that the price named for the plant was reasonable. On behalf of the Corporation, Mr. T. J. Cotton, the Inspector of Public Lighting, was examined by Mr. M'Sheehy; his evidence, briefly stated, being that the price fixed by the Company for the plant was excessive. He was further examined on Wednesday, when evidence was also given by Mr. F. Leonard, of the firm of Messrs. S. Pontifex and Co., of London, and Mr. A. Fahie, C.E., with the view of showing that the price was too high. At the close of the evidence, the Arbitrators and the Umpire proceeded to make a personal inspection of the plant. On Thursday, the lists of the property prepared by the Gas Company were compared with those of the Corporation; and some concessions were made on both sides. The arbitration concluded early in the day.

Messrs. Crosby Lockwood and Son's New Works.—Among the new works announced by Messrs. Crosby Lockwood and Son, we notice the following: "The Analysis and Valuation of Fuel, Solid, Liquid, and Gaseous: a Manual for Chemists and Engineers," by H. J. Philips, F.C.S.; "Asbestos: Its Properties, Occurrence, and Uses," by R. H. Jones; "Ventilation: A Practical Handbook for Sanitary Engineers, Architects, &c," by W. P. Buchan; "The Number, Weight, and Fractional Calculator," being the third edition of "The New Calculator," by W. Chadwick; "Electric Light: Its Production and Use," by J. W. Urquhart (fourth edition, revised and extended); and "The Mechanical Engineer's Office Book for Machine and Boiler Construction," by G. Nelson Foley.

THE ASSESSMENT OF THE CAMBRIDGE GAS COMPANY'S PROPERTY.

At the Meeting of the Cambridge Board of Guardians on Wednesday, the 8th inst.—the CHAIRMAN (Mr. W. Bond) presiding—the question of the assessment of the local Gas Company's property was unde consideration.

Mr. BULLOCK, in accordance with an application which had been received from the Assessment Committee, moved—"That the consent of the Guardians be given to the Assessment Committee appearing as respondents, in the name of the Guardians, in the appeals of the Cambridge University and Town Gaslight Company at the Borough Quarter Sessions, and that Mr. W. Marshall, of London, surveyor and valuer, be appointed to assist the Assessment Committee in the valuation of the rateable hereditaments of the Gas Company, situated in the several parishes in the Union." He said that the Assessment Committee (on which the University, Town Council, and Guardians were represented) had valued all special properties in the borough to the satisfaction of the parties concerned, with the sole exception of the Gas Company. The Company's works were situated at Barnwell, but they had pipes which were rateable, spread over every parish in the town. It was, therefore, impossible to rate them except as a whole. It was decided to direct the parish officers what to do; and in the first instance, in depositing the original list, they raised it by about 50 per cent.—from £4500 to £6800. This was in order to get the figures from the Gas Company by way of appeal. The time came when they did appeal; and, in order to support that appeal, they had to furnish the Committee with their balance-sheet. In the case of works of this nature, the only legal way of rating them was to ascertain the profits of the Company, and make certain calculations on them; and for that purpose they had to obtain the balance-sheet. Following this, the Company asked that the Directors should meet the Assessment Committee, and bring with them their adviser. This was done; and after hearing the case laid down by the Company's expert, the Assessment Committee agreed to reduce the assessment from £6800 to £5400. They had hoped this would be satisfactory to the Company; but in spite of the great reduction—simply increasing the assessment from £4500 to £5400—they next heard that the Company would object unless they reduced it to £5000. The Committee met and discussed the arguments and the figures before them; but they felt it would not be right, remembering they had raised the assessment of other property in the town, to be led to that extent without themselves having the assistance of an expert. They therefore called in Mr. Marshall, who assisted them in the previous assessment, with the result that he advised them that their valuation could be fully sustained—indeed, it was very moderate. The point of difference really was this: They could not get away from the published statement as to the cost of materials necessary for making gas, the amount of gas sold, the amount of coke sold; and the Committee also obtained certain figures which finally finished at the very figure which they had decided upon—£5400. But the Company's valuer did two things. He insisted, inasmuch as there was a probability of a rise in the price of coal and the cost of labour, that they should reduce the assessment upon that supposition. The case of the Committee on this point was that they were bound by the published balance-sheet, and should not allow any probability of a decrease of profits to influence them. If the Company did not get sufficient profit at the present price, they would raise the price of gas; and therefore, after considering the case, the Committee were of opinion that the claim could not be allowed. The Company, he might mention, carried on a fittings business, which produced something like a net profit of £400 a year. The Company's expert claimed that as this was a business, it was not assessable under the Companies' Act. The Committee did not oppose this at first; but their expert told them distinctly that ten years ago he advised the Committee that this business was carried on under the Act, and was assessable and should be added. He took a different method of calculating their profits. He found they had year after year paid dividends of 10 and 7 per cent. on the capital; and they had also increased their capital account without raising any money. It was very simple. If they extended their mains into Romsey Town and charged it to their revenue account, really that should be deducted, otherwise there would be a greater profit. Therefore, if the Company found their capital account increasing without any apparent means, instead of creating sufficient capital to pay their way, they borrowed money and paid interest. That a tenant would not have to pay, but it came out of the capital. Further they did what was done in London; they had created, or carved out of their balance in the course of last year a reserve fund, amounting to £10,000. He did not say it was provided in addition to the dividends in that year, but it was an accumulation of profits of previous years; and to ascertain their profits they must take account of it. He had, therefore, no doubt that the amount which they had reduced it to could be maintained. The Clerk had communicated with the Gas Company; and they had made an offer, instead of fighting it at the Quarter Sessions, of taking the thirteen parishes separately—that the parishes should be consolidated and the appeal heard in one. They had not yet agreed to this; but they now heard there was a suggestion that the matter should be referred to an arbitrator. One of the reasons given by the Company for this was that they wanted the matter adjourned because their expert could not attend. He thought the costs would be materially reduced if the Board would agree to appoint Mr. Marshall to help them to fight the case. He would also propose—"That the Guardians consent to the appointment of a barrister-at-law to be mutually agreed upon by the Assessment Committee and the Cambridge University and Town Gaslight Company to act as arbitrator in the matter pending between them with reference to the valuation of the Gas Company's premises, and the appeals against the poor rates by the Company." He thought the Board would agree that the Assessment Committee had done all they could to settle the matter without law proceedings, and that they did their very best in all the other cases to complete that great work without the expenditure of a single shilling, except that which the Board now asked for.

Mr. E. C. YOUNG seconded the resolutions, which, after a brief discussion, were adopted.

At the Cambridge General Quarter Sessions on Monday of last week, Mr. Ellis applied for an order of reference in the case in which the Cambridge Gas Company and the Assessment Committee of the Cambridge Board of Guardians, and the Overseers and Churchwardens of St. Andrew-the-Less, were concerned. He said that twelve other parishes had undertaken to accept this as a test case, and to abide by the decision. Mr. Turner, for the respondents, said the matter was really to be referred to the arbitration of Mr. Albert Young. As Mr. Turner only appeared for the parish of St. Andrew-the-Less, and the other parishes were not represented, the Recorder (Mr. J. R. Bulwer, Q.C.) made the order as to that parish, the other parishes being struck out.

THE USE OF GASEOUS FUEL FOR THE ABOLITION OF SMOKE.

The Directors of the Manchester Technical Laboratory and Permanent Chemical Exhibition have lately organized a series of lectures on scientific subjects of popular interest, to be delivered monthly during the autumn and winter. The question to be dealt with in the five lectures already fixed is the pollution of air and water—the former by the production of smoke, and the latter by sewage. The course was opened on the 7th inst., under the presidency of Mr. A. E. Fletcher, the Chief Inspector under the Alkali, &c., Works Regulation Act, by Mr. G. E. DAVIS, who discoursed on "Manufacturing Smoke." The following is an abstract of the first portion of his lecture; the latter part, dealing with the use of gaseous fuel for the prevention of smoke, being given in full.

The lecturer began by stating that, for purposes of discussion, smoke might be conveniently divided into two categories—manufacturing and domestic; and that each would require treatment from its own special standpoint, as the remedies proposed for the one would not deal satisfactorily with the other. In speaking of smoke, he referred, of course, to that produced by the combustion of coal. Having performed some introductory experiments to show the very varying temperatures at which combustible substances ignite and burn, Mr. Davis proceeded to illustrate this with a piece of coal. He explained that the first application of heat to coal results in the liberation of the more volatile products, leaving behind the more fixed portion, or coke. This is what takes place when coal is thrown on a red-hot fire, either in a factory furnace or in a domestic fireplace, forming pulsations, so to speak, in the combustion process; the emission of smoke being coincident with the commencement of each pulsation. Roughly, one-third of the component parts of coal may be taken as being volatile under the application of a moderate degree of heat; the other two-thirds remain fixed, and only burn and pass off as gaseous products with the air supply properly maintained.

It is well known that, when ordinary fuel is charged into a red-hot furnace, the distillation process occupies but a few minutes, and in that space of time one-third of the weight of the coal charged in is driven off, while the air supplied is tolerably constant; in fact, the large gaseous volume suddenly generated by the distillation of the coal must certainly check the inflow of air at a moment when more is required. Moreover, the gaseous portion of the coal requires considerably more air for complete combustion per unit of weight than does the fixed portion. The lecturer proved his proposition by taking the example of a Lancashire boiler fired by hand; and he showed that in practice a condition of things the very reverse of this was usual. He proceeded to refer to the attempts which have been made to afford the necessary additional air supply when furnaces are newly charged; but he declined to vouch for their efficiency in action. Having shown the importance of time and the maintenance of the temperature of combustion as applied to hand-firing, he directed attention to the various kinds of mechanical stokers now in use, and indicated their advantages and drawbacks. He expressed the opinion that a well-arranged mechanical stoker would always show a better utilization of heat-units from the coal than the most perfect hand-firing; but, *cæteris paribus*, the difference was not always so appreciable as some inventors would have people believe. The greatest drawback to mechanical stoking was the fluctuating requirements of the steam user. The mechanical stoker could not, he asserted, properly be called a smoke consumer. It was simply an apparatus to feed the fuel into the furnace in a continuous and scientific manner, and to give easy access to the air supplied by breaking up the clinker—causing it to leave the fire-bars; it allowed of an almost perfect regulation of the air supply, so that much larger quantities of coal might be burned on a given grate-area without smoke being produced. With respect to under-grate blowers, Mr. Davis said it was a well-known fact that less air was required for combustion per pound of fuel burned when the air is forced into the furnace than when the products of combustion are simply withdrawn by the chimney draught; and it was possible that some day steam users would settle down to the mechanical stoker, combined with an under-grate blower, as the orthodox method of steam raising. The lecturer next proceeded to make some remarks on another system of burning coal smokelessly—viz., by first converting it into gas.

He said: All of you have heard of water gas. Well, no one would think of firing steam-boilers with water gas, but what is called producer gas may often be, and is, so employed. Producer gas is a by-product, so to speak, of water gas; but it is also made as a substantive product in the Siemens, Dowson, or Wilson producers. It is very easy to burn this gas without causing smoke; but though some few have stated that there is a pecuniary advantage in using it, I believe that this is so only under special conditions and circumstances. Producer gas must not be confounded, in any way, with coal gas as we ordinarily know it. The heating powers of the two are very different, and must be duly considered. One pound of coal gas will give out 12,233 units of heat, while a pound of the best producer gas will give out but 1000 units. To put it more plainly, 12 lbs. of producer gas will not do more heating than 1 lb. of coal gas, even when the producers and the combustion are well managed, while if they are badly

managed, gaseous fuel may become a very expensive luxury indeed. Producer gas is, bulk for bulk, nearly twice the weight of coal gas. So that 6000 cubic feet of Dowson gas are only equal to 1000 feet of coal gas; and if, as stated, Dowson gas can be made for 4d. per 1000 cubic feet, this is equal to using coal gas at 2s. The tests made at the Smoke Abatement Exhibition of 1882 with this gas, as compared with coal gas, show a ratio of 4·17 : 1; but I incline to the opinion that this is too favourable for general practice. The industrial application of gaseous fuel seems destined to receive a fresh impetus through the introduction of Mr. Mond's patented process, in which ammonia is recovered from the products of combustion, or rather from the products of the gasification of coal.

We may now turn our attention to the composition of the gaseous products of combustion from ordinary coal and coke. The gases from the flues of a carefully-fired Lancashire boiler, not overworked, may be stated in percentages as: Carbonic acid, 10·4; oxygen, 6·4; nitrogen, sulphurous acid, &c. 83·2. There is no carbonic oxide. The amount of soot passing away by the chimney averages about 6 grains per 100 cubic feet of gases; and the sulphurous acid of the smoke averages, with good coal, 0·8 grain per cubic foot. This sulphurous acid is an invisible gas suffocating in its nature to animals, and most destructive to vegetation. It diffuses into the atmosphere, dissolves in the rain, the dews, and the mists. It oxidizes into sulphuric acid, or oil of vitriol, and does far more damage in its new guise than in its old form. It permeates and rots our picture-cords and window-curtains, the sash-cords of our windows, and the leather bindings of our libraries; spreading destruction around with a lavish hand. The deleterious nature of the sulphurous acid contained in the products of combustion from ordinary coal has not been sufficiently recognized by those reformers who have sought to ameliorate our atmospheric conditions. The sulphurous acid of coal smoke is a far greater evil than that of the black or visible portion; yet it is the latter portion that is usually attacked as being the author of so much mischief. [The lecturer here showed by experiment the effect of sulphurous acid on colours.]

Many recent writers on the smoke question have endeavoured to prove that, if smoke is totally suppressed, much injury will arise from the formation of carbonic oxide—a very deadly gas. This argument is totally without foundation; in fact, it is false in the extreme. In a well-fired boiler, to which sufficient air is carefully admitted, there is no carbonic oxide whatever to be found in the flue gases.

In the course of his concluding remarks, Mr. Davis said he thought he had shown that, with proper means, visible smoke could in all cases be prevented, without expense, if producers of it would only put their shoulders to the wheel in the right way.

GAS AND ELECTRIC LIGHTING IN BERLIN.

A report lately presented to the Berlin Municipality on the subject of the lighting of the city in the past financial year contains some interesting particulars which it may be useful to reproduce.

Taking gas lighting first, we find that the consumption increased by 3,750,000 cubic metres as compared with the previous year, though this was a drop from the figure of 1888, which reached 5,000,000 cubic metres. This result is rather surprising, seeing that the population of the city was higher by 54,000 persons, and that there was greater commercial and industrial activity. But the cause is to be found in the more vigorous competition to which gas has now to submit, not merely from the electric light, but also from petroleum. With regard to the latter illuminant, great efforts have been made by manufacturers in Berlin as elsewhere, to improve the construction of lamps intended for the consumption of mineral oil, and to increase the power of the burners. The extent to which this material is employed may be judged from the fact that, whereas the imports of petroleum amounted in 1887 to 47,300 tons, in the following year the figure reached 54,000 tons. Gas is supplied to the consumers from four stations; the total quantity sent out last year being 90,210,000 cubic metres, or about 3184 million cubic feet. The amount received for gas sold was £20,000 more than in 1888; and a higher price by £30,000 was obtained for residuals. The gas used for other than lighting purposes is subject to a reduction of 20 per cent.; but this concession has not had the effect of increasing the consumption to any material degree. The works already established have been sufficient to satisfy requirements; but as they are not capable of any great enlargement, the authorities—confident in the expectation of a considerably extended demand for gas in the future—have decided on erecting another station, and the necessary financial arrangements have been made for purchasing the requisite land. The manufacturing portion of the works will be located in the immediate vicinity of Berlin; but the storeage plant will be erected at Charlottenburg. The gas supply of Berlin is not entirely in the hands of the Municipality; a portion of the business falling to the Imperial Continental Gas Association. The Association have two manufacturing stations in the city, and one in the adjacent commune of Schœneberg; the supply of the latter place, both public and private, being their exclusive right, for which payment is made to the Municipality. The total quantity of gas furnished by the Association last year for public and private lighting amounted to about 1165 million cubic feet.

Electric lighting is unquestionably making great advances in Berlin. Last year there were employed for the lighting of the Leipzigerstrasse 36 arc lamps, which were kept burning till midnight; while in the fashionable promenade Unter den Linden there were 104 lamps, of which 56 were kept alight all night—the rest being extinguished at twelve o'clock. At the close of the past financial year (March 31) the number of public establishments lighted by electricity was 450, as compared with 300 at the corresponding date of the preceding year; being an increase of 150. In these there were 826 arc and 31,417 incandescent lamps, as against 540 arc and 23,016 incandescent lamps in 1887-8—an increase of 286 and 8401. The number of private establishments lighted at the end of March last was 237; as compared with 189 at the close of the previous year; being an increase of 48. Gas-engines were employed in 79 cases in supplying the light—an advance of 26 on the preceding twelve months. There were 2796 arc and 31,399 incandescent lamps in private establishments, as compared with 1709 arc and 22,536 incandescent lamps in 1887-8; being a rise of 1087 and 8863 respectively. The following are the totals for the two years: Establishments lighted by electricity on March 31, 1888, 489; do. on March 31, 1889, 687—increase, 198. Total number of arc lamps in use at the above-mentioned periods, 2249 and 3622—increase, 1373; do. of incandescent lamps, 45,552 and 62,816 – increase, 17,264. The supply is furnished from two central stations; but, in view of the progress already made, a project is on foot for the erection of two others. When these are completed and in operation, the business of electric lighting in the German capital will have attained considerable proportions.

THE SUPPLY OF GAS AND ELECTRICITY IN MASSACHUSETTS

In the course of an article on "The Supply of Gas by Municipal Corporations" which appeared in the JOURNAL for the 16th ult. (p. 609), reference was made to the fact that the Massachusetts State Legislature had had before them a Bill to enable cities and towns in that State to provide gas and electricity. The Bill passed the Lower House successfully; but was thrown out in the Senate. As there is every probability of its being brought up each year till the principle embodied in it is accepted, we give an outline of its provisions.

Any city or town is to be authorized, subject to certain specified limitations, to construct, purchase, lease, or establish, and maintain within its limits one or more plants for the manufacture or distribution of gas or electricity for lighting, heating, or motive power for municipal purposes, or for the use of such of the inhabitants as may require and pay for the same. No city, however, is to exercise this authority unless two-thirds of each branch of the council shall by vote, passed and approved by the Mayor in each of two consecutive municipal years, and subsequently ratified at a legally-constituted public meeting, sanction it; and in the case of towns, the permission of two-thirds of the voters present at two meetings of ratepayers is required. Any city or towns establishing gas or electric light plant within its limits is to issue bonds, payable in a term not exceeding twenty years, and bearing interest at not more than 5 per cent., to cover the cost; but the whole amount of the bonds so issued is not to exceed, at par, 5 per cent. of the total value of the taxable property according to the last preceding valuation. Having established plant, any city or town is to provide by ordinance or laws, as the case may be, for the equitable assessment upon the owner or occupier of any premises a proportionate part of the cost of laying and maintaining the pipes and conduits necessary for the supply of the particular illuminant selected; and the payment of these assessments is to be a condition precedent to the provision of such supply. But even after the assessment has been paid it is not to be compulsory on the part of the undertakers to furnish the supply, except under an order from the Gas Commissioners; and any person aggrieved by a refusal may appeal for redress to the Commissioners. Any city or town having plant may furnish light to an adjacent place, at the request of the authorities thereof. The entire control of the works is to be in the hands of one manager, appointed and paid by the authorities; and at the end of each financial year he is to furnish to them, as well as to the Gas Commissioners, a detailed statement of the general and financial position of the business. The price to be charged for gas or electricity, when once fixed, is not to be changed oftener than once in three months; and the charge is not to be less than the cost price *plus* 4 per cent. interest on the net amount invested in the plant, or greater than will allow a profit of 8 per cent. per annum on the outlay. Deposits sufficient to cover the cost of three months' supply may be required; and the service may be cut off till all arrears have been discharged. Provision is made for the settlement of disputes arising in respect of property required in connection with the establishment of a gas or electric light undertaking; and all general laws are, where necessary, to apply.

Belfast Water Commission.—According to a report presented at a recent meeting of the Belfast Water Commissioners, it is estimated that their total income in 1891 will amount to £38,500; and the expenditure to £38,500.

The Seaborne Coal Supply of London.—A trade between Hull and the Thames is being created for gas, house, and steam coal supplied from the West Riding collieries, and promises to prove successful. There are now three steamers with coal running between the two points—the *Beckton*, the *Ryhope*, and the *Monica*.

Warwick Corporation Water Supply—At last Tuesday's meeting of the Warwick Town Council, the Water Committee reported that they had ordered a constant instead of an intermittent supply of water in the borough, and also a systematic inspection of fittings to prevent waste—an inspection which had already taken place having reduced the consumption of water from 19 to 17 gallons per head per day.

Stockton and Middlesbrough Water Board.—The Finance Committee of the Stockton and Middlesbrough Water Board have recommended the payment out of the revenue of the past half year of £9000 to the Middlesbrough Corporation, of £7500 to Stockton, and of £1500 to South Stockton. They will, however, require on capital account £36,000; and this will be levied on Middlesbrough, Stockton, and South Stockton in the proportion of one-half, five-twelfths, and one-twelfth respectively.

The Quality of the Chester Water Supply.—In view of the recent contradictory reports that have been made by high authorities regarding the water supply of Chester, a sample of the water was sent on the 3rd inst. (through a firm of accountants in Liverpool, so as not to disclose its origin) to Dr. Campbell Brown, of the University College in that city. The results of his analysis have been published. He says that the water is clear and colourless; and appears to be excellent for domestic use. It is soft and free from organic pollution; and on being exposed on a surface of lead for some days, it did not take up an appreciable quantity of lead. The usual mineral salts are found in solution in it, and in very moderate proportion. This confirms the testimony of Dr. Tidy.

THE WATER INQUIRY BY THE CORPORATION OF LONDON.

Close of the Sittings.

The Committee appointed by the Corporation of London to inquire into the question of the water supply of the Metropolis held their final sitting at the Guildhall on Monday last week (as briefly recorded in the JOURNAL on the following day)—Sir GUYER HUNTER, K.C.M.G., M.P., in the chair.

Sir J. B. MONCKTON, the Town Clerk, was the first witness called. He said that at the last public sitting of the Committee in London, he stated that up to that date, he had received no communication from the New River Company; that Company being the only one that had not replied to his letter with reference to the inquiry (see *ante*, p. 363). A few days after that sitting he received a letter from the Secretary of the Company to the effect that he had sent a letter in reply to his (the Town Clerk's) communication. That letter, a copy of which was enclosed by the Secretary, ran to the effect that he was instructed by the Directors to state that, having regard to all the circumstances under which the inquiry was taking place, they did not feel that they could usefully assist in the proceedings of the Committee. In the course of further evidence, the Town Clerk informed the Committee that the previous letter of the Secretary did not reach him at once, as it was the vacation, and all letters addressed to him personally followed him about. Sir John added that this letter completed the correspondence he had had with the several Water Companies.

The PRESIDENT remarked that he had made various inquiries with reference to the financial aspect of the question before them. He had hoped that Mr. Watson, a well-known banker and financier, would have been present that day in order to give evidence. Unfortunately, owing to absence from town, he was unable to be with them. He had, however, written a letter, in which he said that in his opinion £30,000,000 could be easily raised on a water security at 3 per cent. interest. Mr. Watson added that he could make this assertion with every confidence, based on his financial experience of over a quarter of a century.

Mr. ROSE INNES expressed regret that Mr. Halse was not present to give evidence with reference to the transfer of water undertakings from private companies to public bodies. Mr. Halse's evidence would have been of a practical character, as on one occasion he was the solicitor in connection with the transfer of a water undertaking to a local authority. No doubt, however, Mr. Halse would later on be able to give the Committee in private some useful evidence on this point. He concluded by putting in as evidence a list of Acts authorizing the transfer of waterworks to local authorities; the number being upwards of seventy.

The PRESIDENT remarked that the public inquiry was now closed. The Committee had gone into the matter very carefully, and had sought far and wide for evidence both for and against the existing state of affairs. They had also visited Manchester and Glasgow to ascertain the mode of supply adopted by the Corporations of those cities. He trusted that the conclusions the Committee had come to would be considered of an impartial character, and just to all parties concerned. He moved the adjournment of the Committee to consider and prepare their report.

The motion having been carried, the proceedings terminated.

The Committee's Report.

Last Friday, the report of the Committee for County Purposes of the City Corporation on the subject of the Metropolitan Water Supply was issued.

The report states that the members were empowered on the 27th day of February, to hold a public inquiry into the matter; the expense thereof being limited to £2000. Sir William Guyer Hunter, K.C.M.G., M.P., accepted the post of President. The inquiry was opened in the old Council Chamber, Guildhall, on Friday, the 23rd of May last; and in all, there have been 13 sittings, during which 37 witnesses have been examined, whose evidence has been printed *in extenso*, together with various documents handed in and bearing thereon.

There was a general consensus of opinion that the supply of water to the public should be in the hands of a public authority; and no longer remain, as it is at present, under the control of private Companies. A considerable amount of evidence was given showing numberless inconveniences and injustices inflicted under the present system; and upon one point it is clear that consumers, who from their position or wealth can make exceptional terms with the Water Companies, are thus able to obtain advantages which are not shared by the general public. This statement, which appears at full length in the evidence of Mr. Archibald Edward Dobbs, was made in public; and, although the Water Companies were invited in general and in specific terms to join in the inquiry, no contradiction has been forthcoming. On this point the report remarks: "It is needless to point out that such an arrangement prejudices the other consumers, and would render nugatory any parliamentary action following on the policy of the various Gas Acts, by which the price of the article supplied would rise or fall according to the dividends payable."

With the impression that the supply should be in the hands of a public authority, the Committee visited Manchester and Glasgow to inquire the terms and mode in which the administration of the supply was carried out in those cities. The impression left on the minds of the Committee by the evidence given in London was strengthened by that given in Manchester and Glasgow. In each of these cities the officials examined gave evidence showing the advantages and conveniences that had accrued to the consumers and to the cities themselves from the supply being in the hands of a public authority. The report then deals with the history of the water question in Manchester, and states that the mode in which the transfer was there effected would prove a useful parliamentary precedent for a Bill for a similar purpose with reference to London.

On the point of supply by meter, the Committee consider that in any comprehensive scheme of legislation a clause should be inserted giving the consumer the right of being supplied by meter; and although a detail, they consider it to be an important one. They also think that the clauses in the Manchester and Glasgow Acts requiring all fittings to be issued with the approval and under the mark of the water authority should be inserted in any Bill on the subject which may be presented to Parliament.

The Committee notice a rumour to the effect that they proposed solely to investigate the supply of water to the City of London, for the purpose of saying most emphatically that they directed their attention to the water supply of the whole Metropolitan area; and indeed (they go on to say), as the majority of the citizens of London who enter the City for the purpose of gaining their livelihood, reside with their families in parts other than the City itself, it is obvious that any such shortsighted policy on the part of the Committee would have been absurd. On this point it ought to be noted that, inasmuch as the area or watershed from which the supply of water must come, for many years at any rate, or until the public authority to be constituted shall think differently, must be that which now supplies the Metropolis—namely, the watersheds of the Thames and Lea and the Kentish chalk, and that the maintenance of that area in a proper sanitary state is quite as important as is the convenient distribution of the water arising from it, they were bound to consider the question as affecting the whole population of London and its suburbs. The population supplied by the Companies is 5,655,619. Sir Robert Rawlinson, when asked whether he had considered the question of other sources of water to be obtained as an alternative supply, replied that there was in the Thames area a sufficient volume of water; and he did not go any farther than that. The sanitary state of this area should, in the opinion of the Committee, be in the hands of the Water Authority which it is suggested should be constructed.

The Committee feel that any attempt to recommend piecemeal legislation would involve quite as much parliamentary trouble and opposition as the recommendation which afterwards appears, for a settlement of the whole question of supply.

A comparison between the position of Glasgow when it emancipated itself from the control of the private Water Companies and the present actual position of the Metropolis, as a whole, is then considered.

The population supplied with water by the Metropolitan Companies is (according to Major-General Scott), 5,655,619; and the estimated value of the whole of the eight Companies' capitals (according to Mr. Wood) is £33,444,506, viz.:—

Estimated value of ordinary capital	£27,726,473
Estimated value of preference and loan capitals . .	5,718,033
	£33,444,506

Assuming that money can be borrowed at £3 per cent. (*vide* Mr. Scott, the Chamberlain), the following would be the financial result:—

The assumed net profits of the London Water Companies available for dividend (*i.e.*, after providing for interest on the preference and loan capitals) amounted, in the year 1889-90 (*vide* Mr. Stoneham) to	£939,806
The interest at £3 per cent. on the market value of the ordinary capital would amount to	831,794
Showing a surplus, on that basis, of available for sinking fund or other purposes.	£108,012

With regard to the Glasgow supply, the undertaking there is pronounced in the report to have been a success, while the average daily supply of water per head in Glasgow and London when compared is instructive. The Glasgow supply for domestic and all other purposes per head is 49·84 gallons; for domestic purposes only it is 33·67 gallons; and the estimated population supplied is 800,000. The figures for London are as follows: Domestic and all other purposes, 29·91 gallons; domestic purposes, 23·93; estimated population, 5,581,491.

The table showing the difference in the relative charges for water in London and at Glasgow is also very striking. While the aggregate charges for water-rate, water-closets, bath, and high service in the case of a £50 house in the Metropolis vary from £2 14s. (Chelsea Company) to £3 4s. (Southwark and Vauxhall Company), in the case of a house of the same character, within the municipality of Glasgow, the aggregate is £1 9s. 2d., with no extra charges. In the case of more highly-rented houses, the discrepancy is even more surprising.

The Committee have no hesitation in recommending that the honourable Court should suggest to Parliament a representation of the areas as the most effectual way of governing the watershed and managing the supply. In the Bill which should be brought in, clauses should be inserted fully empowering the Water Authority to confer with the Thames Conservancy Board and the Lea Conservators when and so often as these bodies respectively shall be ready to meet on the subject; and that such powers should extend to their appointing joint committees, if at any time such a course should be advisable. The representative Water Authority, as the body which should ultimately solve the question, ought to have powers to apply to Parliament on all questions of alternative supply, and power to open wells in the manner indicated by the evidence of Sir Robert Rawlinson—the Lands Clauses Consolidation Acts being incorporated for this latter purpose.

The principle of arbitration in the Glasgow Acts appears to be the fairest and the best solution of the question of payment to the Companies; and the award forms a valuable precedent for the Arbitrators, who should be appointed by clauses in the Bill.

The Committee think that a Commission issued by the Crown would be the most satisfactory mode; that the various Municipal Corporations, County Councils, and Sanitary Authorities, over whose areas the Water Authority would have control, should be represented on the Commission; that, considering that the City of London pays, in effect, one-eighth of the whole of the rates of the Metropolitan area, it should be adequately represented on the Commission; and the position of the London County Council should also be frankly acknowledged and provided for. Proper clauses providing for the retirement of the Directors and for compensation to the officers of the various Water Companies should be inserted; and a certain number of the Directors of the various Companies should be included on the Commission.

The quinquennial assessment makes it imperatively necessary that some solution of the question should be arrived at in the next session of Parliament, and that the Metropolitan members should be communicated with personally upon the point.

The Committee point out, as a question of parliamentary arrangement, that any attempt to merely suspend the Quinquennial Assessment Act would provoke the same opposition of the Water Companies as may be expected to the Bill which is recommended to be brought in next session; and they feel, therefore, more than justified in their opinion that the matter should be dealt with as a whole. If the report be agreed to, it follows that the prosecution of the Bill in Parliament must, at all events technically, fall upon the Corporation, as at the present time no other public body has the power to incur the necessary expenditure.

The Committee remark that the Parliament that shall successfully legislate for the water supply of London will solve a social question, a greater than which can scarcely be presented for their deliberation, or one upon which public opinion has more unmistakeably called for legislation; whilst to delay its consideration is but to still further increase and multiply difficulties, and add to the heavy responsibilities which necessarily surround the question.

The present report carries the question up to the basis of legislation, and lays down the broad lines upon which, in the opinion of the Committee, a Bill should be presented to Parliament.

COVENTRY CORPORATION WATER SUPPLY.

Proposed New Works.

At the last Meeting of the Coventry City Council—the Mayor Alderman C. J. Hill) presiding—the Water Committee presented a report on the water supply of the borough. It stated that the Committee had been in communication with Mr. T. Hawksley; and he had suggested that an additional supply of water should be obtained at Whitley. They therefore recommended—"That Mr. Hawksley be instructed to prepare plans and specification for wells, engines, and works at Whitley, with main to the Barker's Butts reservoirs, and estimate." In proposing the adoption of the report, Mr. Read pointed out that the supply from the Spon-end works was decreasing. In June they were pumping 1,100,000 gallons per day; while now the amouut was 40,000 gallons less. According to their Act of Parliament, they had Radford and Whitley to go to for an additional supply. Radford had been tested, and found wanting. A borehole was pierced there, where it was thought there would be an abundance of water; but the water did not rise to the level of the ground within 40 feet. Mr. Hawksley therefore advised the Committeee not to proceed any further in that direction. He anticipated that a borehole at Whitley would give a million gallons per day; and as to the quality, it had been analyzed, with good results. With regard to the expense of constructing a pumping-station and laying pipes to the reservoirs at Barker's Butts, it would have to be incurred wherever the supply was obtained from. Alderman Maycock having seconded the proposition, Mr. Andrews moved as an amendment, that the debate be adjourned for two months. He did this on the ground that the Council, having only six weeks more to exist, ought not to take upon themselves the responsibility for recommending so costly and unsatisfactory a scheme. He proceeded to argue against the project from a financial point of view; and declared that during the whole of last year they had an ample supply of water—the present temporary shortness being due to the fact that the rainfall last winter was smaller than in any previous winter during 21 years. The Whitley scheme was unsatisfactory to his mind, inasmuch as its situation was too near the present sewage works and filter-beds. Mr. Laxton seconded the amendment, on the ground that he did not think they were justified in determining upon so expensive a scheme on the slight information at their disposal. Dr. Fowler supported the amendment; while Mr. Gulston failed to see what was to be gained by deferring the matter. The Water Committee had consulted one of the best men of the day, and he thought the Council ought to adopt his advice. The discussion was continued to a considerable length; and it resulted in the amendment being lost by 11 votes against 24. The original motion was then carried.

Ceara Gas Company, Limited.—The accounts of this Company for the year ending June 30 last show that there has been a satisfactory increase of rental. The profit on the year's working is £3985, which, added to £1094 brought forward, makes £5079. Deducting the interim dividend paid in April, amounting to £1602, there remains for division the sum of £3477. The Directors in their report recommend that £1000 be added to the reserve fund, and that dividends be declared for the six months ended June 30 last of 5 per cent. on both preference and ordinary shares (the dividend on the ordinary shares free of income-tax); making, with the interim dividends, 10 per cent. on the preference shares and 9 per cent. on the ordinary shares for the year. The balance remaining to be carried forward will be £575.

Proposed Augmented Water Supply for Skipton.—In pursuance of a requisition by a number of owners and occupiers in the Skipton Urban Sanitary District, a public meeting was held last Thursday—the Chairman of the Local Board (Mr. J. B. Dewhurst) presiding—to decide upon the question of an increased water supply for the town. The Chairman stated that the ratepayers were asked to sanction a proposed application to Parliament for powers to acquire the necessary lands for the construction of a new reservoir at High Skibeden, and to borrow a sum not exceeding £40,000 for the prosecution of the works in connection therewith. For three or four years past, it had been obvious that the rapid increase in the population of the town necessitated some extension of the water-works. The Local Board had engaged the services of Mr. G. H. Hill, Water Engineer, of Manchester; and he recommended them to construct a reservoir with a storeage capacity of 11 million gallons. This would provide for the town for the next 25 years. His estimate of the cost of the reservoir and works was £30,000. There were, of course, contingencies of various kinds to face; and the Board had fixed the limit of the sum to be borrowed at £40,000. In conclusion, Mr. Dewhurst proposed that the meeting sanction the proposed application for powers. Mr. Kendall seconded the proposition. A number of questions were asked, and ultimately the resolution was put to the meeting, when the Chairman declared that it was rejected. He then demanded a poll.

NOTES FROM SCOTLAND.

From our Edinburgh Correspondent.

EDINBURGH, *Saturday*.

A proposal is made by the Finance Committee of the Aberdeen Town Council which, as was facetiously expressed to me to-day, means "going back to the dark ages." In a report to the Council which they have drawn up, the Committee state that "it appears to them that the time has now arrived when the ratepayers should derive some benefit from the gas undertaking. When the undertaking was taken over by the Town Council from the Gas Company in 1871, the price of gas was 5s. 5d. per 1000 cubic feet. The price is now 3s. 6d., and although the works and apparatus have been maintained in thorough order, and extensions carried out at a cost of about £102,000, by which the works have been rendered capable of producing three times the quantity of gas produced in 1871, the sum of £87,000 has already been paid off, and the works therefore cost the town a little more than the original purchase price. It appears to the Committee that power should be taken to contribute from any surplus of the gas undertaking towards the carrying out of public improvements, and towards the support of the Art Gallery, Public Library, &c. The system obtains in several of the larger towns in Scotland—such as Glasgow, Paisley, and Greenock—and is also in existence in many of the boroughs in England." If the Committee merely wish to possess the power to make such a contribution, very little objection can be taken to the proposal, because, if sparingly used, such a power would do no harm, and might at times be useful. But if it is the intention of the Committee, should they obtain the power, to make use of it, it would be a huge mistake. The Committee put forward the recommendation upon the strength of the system obtaining in several of the larger towns in Scotland; and they cite three towns in the west of Scotland. So far as Edinburgh is concerned, no such power was conferred by the Act of 1888; and we are better without it. I am informed that in Glasgow, where the power exists, it has scarcely been taken advantage of. The arguments against the proposal are obvious, and need not be followed up; but the Committee may be asked why, when they are about to introduce a system of electric lighting, they do not propose to devote "the surplus" from it to public improvements. Perhaps one of the public improvements which they contemplate effecting with the gas surplus is the electric light itself. This would be a characteristically Aberdonian method of introducing the electric light; but it would certainly be a most glaring injustice to gas consumers to make them pay for a costly and luxurious light to be supplied to others. The Gas Committee of the Council will surely never allow such an interference with their province to be adopted by the Town Council. They need no arguments to defeat the proposal other than can be derived from the face of the report, because the preamble, it will be observed, goes on the assumption that the ratepayers do not derive benefit from the gas undertaking, whereas in the body of the report the Committee go on to show that the community have derived an immense benefit from it.

More than a year ago the Dunfermline Town Council appointed a Special Committee ostensibly to inquire into the subject of public lighting, but really I presume to fish for information which would guide them in their negotiations for the acquisition of the gas undertaking. The Committee reported last Monday; and their report, which deals largely with the question of electric lighting, presents the information the Committee have collected on the subject in a form so crystallized as to be unmistakeable. The document, which has been prepared with great deliberation and care, is very favourable to gas; and one may expect soon to hear of more active measures being taken to promote the gas transfer, which has now been several years in contemplation. The present is looked upon as a very favourable time to raise the question, as, by its contract of co-partnery—a somewhat antiquated form of Company which still exists in several places in Scotland—the Dunfermline Gas Company will come to an end in November, 1891; and it will then require either to be re-constituted, or taken over by the Town Council. At present it has 1455 shares issued, upon each of which £17 10s. has been paid up. These are selling in the market at £28 10s. each, which shows that the property is looked upon by the investing community as a valuable one. A local writer on the subject calculates that the town might pay £30 per share, which would bring out a price of £43,650 for the undertaking. The writer gives his opinions anonymously; but whoever he is, he is living in a fool's paradise if he expects that a prosperous Gas Company like Dunfermline would be prepared, or could be compelled, to sell its undertaking for only 30s. per share above their market value. Prospective profits must to a certain extent be taken into account, and paid for by the purchaser. In the case of Edinburgh, which is the most recent transfer, the price paid was (on Mr. Smith Clark's showing, and not contradicted) as much as 33 per cent. over the amount of the subscribed capital, and 25 per cent. above the market value of the shares. The paid-up share in Edinburgh was £25, which was selling before the transfer at £58, and the stock rose after the transfer to £72 per share. Taking into account the difference between the subscribed and the selling price of the shares in the Edinburgh and the Dunfermline undertakings as giving a very good approximate idea of the value of the respective undertakings, a proportionate calculation will give a selling price for Dunfermline, on the Edinburgh basis, of about £4 per share above the market value, or £32 10s. per share, which would make the price of the Dunfermline undertaking more than £47,000. Dunfermline has quite as good a prospect before it as Edinburgh. It is one of the most flourishing of Scottish towns; and there is no reason why in its case Edinburgh should not be taken as a precedent. If this were done, the cost of the transfer would require to be added to the price, and stores would have to be taken and paid for, which would probably raise the cost to the community to above £50,000. Even at this figure, the gas undertaking, according to its recent form, would realize a return of 6 per cent. to the community, which would be a very good bargain, because it would provide a good surplus out of which the price of gas might be reduced, or the works extended. As usual when such a proposal is taking shape, attempts are being made to discredit the Company in the eyes of the public. In this case the effort is but a mild one, consisting simply of an

endeavour to make out that the Company have been charging too much for the gas consumed in the public lamps. The Directors have prepared a statement in reply to the charge which has been made against them, the effect of which, I understand (though it has not been published yet), is that the Town Council themselves did not seek a renewal of the five years' agreement of 1872 when it expired, and that, with the exception of dropping Glasgow out of the list of towns upon the average of which the price was to be charged, when the quality of gas in Glasgow was reduced, they have adhered to the agreement.

The difficulty between the Peebles Gas Company and the Police Commissioners as to payment by the Company for the use of the streets has been settled. On Sept. 18, the Town Clerk wrote to the Secretary of the Company pointing out that it would be most awkward to have to assess the damage caused to the streets by openings every time any were made; and that the Commissioners would prefer the payment of a fixed annual sum (whether or] not it were termed rent) for the use of the streets. He also pointed out that since May last the roads within the burgh have been, by the Local Government Act, placed under the charge of the Police Commissioners, who are now entitled to charge for any damage to them. The Commissioners suggested a payment of £25, and offered to pay for the whole of the gas consumed in the public lamps, and to maintain the lamps. In reply, the Secretary of the Company wrote, on the 24th ult., that his Directors could not acknowledge that the Commissioners had any right or power to make a charge for the use of the substrata of the streets by the Company for their pipes, but that they were quite willing to recognize any claim for damage which might be done to the surface; and, without prejudice to their legal position, offering an annual payment of £20. They were also willing to allow the Commissioners a discount of 10 per cent. on the account for gas consumed in the public lamps; but they thought it important, in view of questions of leakage arising, that they should retain the maintenance of the public lamps in their own hands, which would be equivalent to their maintaining the lamps for £5 a year. This offer was accepted by the Commissioners; one of their number stating that it was equal to a reduction of about 30 per cent. on the cost of gas for the public lamps. The Company have thus acted most handsomely in bringing this very difficult question to an end without committing themselves either by submitting to an unjust demand, or standing out for unreasonable terms.

Lord Provost Whittet, at the meeting of the Perth Water Commission on Monday, made the very gratifying statement that, notwithstanding that last year they equalized the water-rate over the whole area of supply, and paid out of revenue the entire cost of the Act for the purchase of Moncrieffe Island, there was still a surplus on the year's transactions of £713. The Commissioners thought that the ratepayers should again have the benefit of their prosperity; and they reduced the water-rate from 8d. to 7d. per pound. During the year which ended on the 30th ult., the revenue was £6601; and the expenditure, £5887. The estimates for the current year show a revenue of £5310, or with the surplus from last year, of £6023; and an expenditure of £5875—leaving a surplus of £148. The assessments are fixed at a domestic rate of 7d per £1; a shop rate of 3½d. per £1; and a public rate of 1d. per £1.

From our Glasgow Correspondent.

GLASGOW, *Saturday*.

The work of rendering an "account of their stewardship" by members of Town Councils and Police Commissions is now proceeding so vigorously all over the west and south of Scotland, that it is very difficult for a correspondent in my position to keep pace with the numerous utterances that are being made, here and there, almost every night during the week. Several of the Glasgow municipal governors have had "deliverances" this week on gas affairs and electric lighting; but I shall leave them over in the meantime until I have taken notice of statements made at municipal ward meetings in other places.

At the annual meeting of the Fourth Ward electors at Coatbridge last night, Bailie Neil gave an explanation of the strained relations that have for some time existed between the Town Council and the local Gas Company; the result of which was that the Council had taken the lighting of the streets into their own hands, and had thereby effected a saving of some £300. (I suppose the speaker meant £300 per year.) This had been accomplished, he said, by reducing the size of the gas-burners. A new arrangement had ultimately been come to whereby the Company undertook the lighting for this year, the saving by the reduced burners being the same—namely, £300; and he was sure that Coatbridge was better lighted than a great many other towns.

Provost Rodger, the head of the municipality of Greenock, gave vent to a few remarks on gas matters when addressing his constituents on Wednesday night. He said he quite agreed that the consumer should get the benefit of the reduction in price of the gas. They had reduced the price from 4s. 9d. some years back, till now it was at 3s. 4d. per 1000 cubic feet; and he hoped that next year they would be able to reduce it still further. Looking to the increased price of coals, the increased wages of the workmen by shortened hours, the bad times (which he thought were better now than when the matter was considered), and the possible fall in the price of residual products, he thought they were justified in taking the course which they had adopted. Although he could not see his way this year to move a reduction in the price of gas, he hoped that next year there would be one, so that the consumers would get the benefit. It should be borne in mind, he continued, that any profits made by the gas-works must by the Act of Parliament be paid over to the Police Board; so that if the surplus were exhausted, or rather prevented by reducing the price of gas, an additional 2d. or 3d. of taxation would have to be imposed to make up for the surplus. That would undoubtedly reach those who at present used no gas, and would oblige them to assist in paying their share to the revenues of the Trust.

Councillor Mitchell, addressing the electors of Sixth Ward in the same town last night, remarked that the profit from the gas-works was a very interesting matter to the ratepayers. Twelve months ago it was estimated that they would have a surplus of something like £1500; and at the end of the year they found that they had £3456 12s. 8d. When the surplus came before the Gas Committee, it was thought to be very satisfactory, more especially when they had an additional cost in the way of an increase of a halfpenny per hour to the gas stokers, and also the reduction in the working hours. That being the case, he thought it his duty in the Gas Committee to move for a reduction of 2½d. per 1000 feet of gas to the consumers; but he was beaten in that matter by what he thought was a very narrow majority. During the seventeen years that the gas-works had been at Inchgreen, the ratepayers had had handed over to them by the Gas Committee the sum of £67,684 4s. 9d., or an average of almost £4000 each year. Now this, he thought, was not fair to the gas consumers. He held that the gas consumers ought to get the gas at as cheap a rate as possible, always allowing, of course, for a small surplus at the end of the year. He had observed that at the First Ward meeting Bailie M'Onie thought it would be a good thing to take the gas surplus for the purpose of widening Ratho Street bridge. He (Mr. Mitchell) did not know whether the East-End ratepayers should get all the benefit of that or not; but it occurred to him that if they could devote the surplus to some other purpose, where the whole of the ratepayers would participate, it would be much better.

So far as Glasgow is concerned, the most important statement made on gas affairs during the week by any of the Town Councillors was that by Mr. Mechan, at the annual meeting of the Thirteenth Ward electors. This gentleman is a practical hand in one of the iron trades; and has much skill in many matters which come before the Corporation Gas Committee, of which body he is a member, as also the Convener of the Special Sub-Committee on Gas-Stoves, Meter Department, &c. Referring to the Gas Trust, he said that the capital of the Trust was now £660,000; that the annual revenue was £418,000; and that the profit of the gas-supply undertaking last year was £50,000. Wages last year had amounted to 10s. 4d. per ton of coal carbonized, as against 8s. 8d. in the preceding year. That was owing to the re-arrangement of the working hours of the stokers. Had the stokers been working the same number of hours as they wrought formerly, the Trust would have been able to make a reduction of at least 2d. per 1000 cubic feet in the price of gas. Last year 4000 new meters were given out; and the total number in use was thus brought up to 135,500. He also stated that the Town Council had decided to introduce electric lighting in some of the streets in the centre of the city; but he had no hesitation in telling his audience that the electric light was almost exactly double the price of gas. Mr. Mechan, I may mention, is seeking re-election; and in this he is being opposed by Mr. Angus Campbell, a local lawyer. It was he who professionally advised and guided the Glasgow gas stokers when they made their move for a reduction in the length of the working shift towards the end of last year. This gentleman has been specially pitted against Mr. Mechan because he is supposed to have treated the men and their agent uncourteously on the occasion referred to. A stiff fight is expected in the Thirteenth Ward.

During the past week there has been much weakness in the Glasgow pig iron market. No new feature of special importance has arisen in regard to the strike and lock-out of the blast furnacemen. The price of Glasgow pig iron was down to 49s. 11½d. per ton on Wednesday; but at the close yesterday there were buyers at 50s. 5d. per ton cash, as compared with 54s. 9d. at the opening on Monday.

Business in the local coal trade is being severely checked by the action of the miners, many of whom are limiting their working time to four days per week, in the hope and expectation that they will be able to force an advance of wages. In some instances prices are easing off a little.

Monte Video Water-Works Company, Limited.—The Directors of this Company have declared an interim dividend at the rate of 5 per cent. per annum, for the six months ending June 30 last.

The London County Council and the Water Question.—According to the London correspondent of the *Manchester Guardian*, the Engineer of the London County Council (Mr. A. R. Binnie, M. Inst. C.E.) has prepared an exhaustive report on the subject of the water supply of the Metropolis. He is of opinion that a new and independent supply from the Welsh mountains would be one of the best modes of solving the problem now before Londoners.

Stroud Water Company, Limited.—The ordinary half-yearly general meeting of this Company was held last Tuesday, at the London offices, Rear-Admiral Bythesea in the chair. The report (which stated that 6460 shares had been allotted to date) and accounts having been taken as read, the Chairman moved their adoption. He described the prospects of the Company as steadily improving; and stated that the Stroud Local Board had served them with notice to supply with water the town of Stroud, and that negotiations were proceeding for supplying several of the Company's outlying districts, on guarantees of water-rates amounting to not less than 10 per cent. per annum. He concluded by expressing the thanks of the shareholders to Mr. P. H. Stevens, the Secretary, who had ably carried on the work of the London office. The motion was agreed to, and the proceedings closed.

The New Water Engineer at Bradford.—At the meeting of the Bradford Town Council last Tuesday, Alderman Robertshaw moved the adoption of the minutes of the Water Committee, which contained a resolution recommending the Council to advertise for a new Water-Works Engineer, at a salary of £1000 per annum. Alderman Holdsworth having seconded the motion, Mr. Jackson asked whether it was not a fact that their late Engineer (Mr. A. R. Binnie) recommended his colleague next in office as his successor, and gave the strongest possible reasons for such an appointment. Mr. Jackson thought the Council were entitled to some explanation why the Committee recommended an advertisement being issued. Mr. R. W. Silson said he could not understand why Mr. Binnie's recommendation as to his successor had been disregarded; and he moved, as an amendment, that the salary should be £700 a year. Whatever sum was offered, there would be many applicants for the post; and it was possible that the Council might after all appoint an inefficient man. If they obtained a good man, they could advance his salary to £1000 or £1500 in proportion to his worth. Mr. Walker seconded the amendment, which, however, was defeated by 32 votes to 10; and the original motion was then adopted.

CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, *Oct.* 18.

Sulphate of Ammonia.—A steady tone continues to prevail; but there is hardly an improvement in values. £11 11s. 3d. is still the highest figure obtainable at Hull; and some business has been reported even at £11 10s. Leith and Liverpool are quoted at £11 10s. to £11 12s. 6d., according to quality. There have been rather larger quantities offering. But most of the parcels have been sold at fair prices; and apparently the demand is keeping about equal pace with the production. Continental inquiries have been few this week; and the buyers there seem mostly interested in spring delivery, which is somewhat strange. As they cannot hold stocks to any extent for use this year, it is possible they may anticipate lower prices with the increasing production; and hence the near business may be simply one from hand to mouth. Seeing the firmness of makers, it is improbable that prices will be affected thereby. A danger is more likely to result from the unsatisfactory position of nitrate, the values of which seem somewhat on the decline.

LONDON, *Oct.* 18.

Tar Products.—The small stocks in the hands of manufacturers, and the comparatively small production, has helped the operators to further put up the value of benzol; and although little business is doing, sales have been made at 4s. 6d. for nineties, and 3s. 5d. for fifties, and 3s. 6d. is now asked for the latter. The high prices asked for anthracene have stopped business in the meantime. It is expected, however, that the low stocks, and the increased requirements of colour-makers, will enable producers to maintain the *status in quo*. Pitch is not quite so strong; and, although prices are quoted higher, very little business have been done in it. Common oils are in better request for burning purposes; and it is expected that the worst has been seen of them for some time to come. Some tar contracts have been made during the week at prices ranging from 23s. to 28s. To-day's quotations are: Tar, 25s. to 30s. Pitch, 30s. to 31s. Benzols, 90 per cent., 4s. 6d.; 50 per cent., 3s. 5d. Toluol, 2s. 2d. Solvent naphtha, 1s. 9d. Crude naphtha, 1s. 7d. Creosote, 2¼d. Heavy oils, 3d. Carbolic acid, 60's, 1s. 8d. Cresol, 10d. Anthracene, 30 per cent., "A" quality, 1s. 6d.; "B" quality, 1s. 2d.

Sulphate of Ammonia.—The lessened production in Scotland has not so far affected this market; and the demand for Hamburg is still unusually slack. Some important contracts have been made during the week at £11 5s. to £11 10s. for 24½ per cent. Gas liquor, according to position, is selling at 7s. to 9s. per ton.

Serious Gas Explosion at Streatham.—Shortly after twelve o'clock last Sunday, a serious gas explosion occurred in Telford Avenue, Telford Park, Streatham Hill, by which two large cavities were made in the principal thoroughfare. Volumes of flame shot up out of the main sewer at two open gratings; the flames reaching higher than the houses. Portions of the roadway and pieces of drain-pipe were carried a considerable distance; but, strange to say, only a few lamps in the immediate neighbourhood were broken. It appears that there had been an unsuspected escape of gas from the main supplying the Telford Park Estate; and the gas having accumulated in the sewer, some passer-by, it is supposed, ignited it by accidentally dropping a lighted match. The nearest station of the South Metropolitan Gas Company—the one at Clapham—was communicated with at once, and a number of men were soon on the spot to stop the leakage. Meantime the holes in the road were covered over with planks, and the road otherwise rendered fit for traffic, by the agents of Messrs. Sutton and Dudley, the owners of the estate. It was not until a late hour that the damage done was temporarily repaired.

Exhibition of Gas-Fires at Maidstone.—From Tuesday to Friday last week the Maidstone Gas Company held, in the Corn Exchange of that town, an exhibition of gas-heating stoves and fires, selected from the large variety of these appliances available at the establishment of Messrs. T. Fletcher and Co., of Warrington. In connection with the exhibition, lectures were delivered on the Wednesday and Thursday evenings by Miss Kelman, who discoursed in an attractive manner upon the advantages of gas for both heating and cooking purposes; her remarks being attentively followed by large audiences on each occasion. The Maidstone Gas Company were among the pioneers in letting out gas cooking-stoves on hire; and they occupy a similar place in respect of the appliances they have just been bringing under the notice of their customers. No expense is entailed on the latter for fixing; this being done by the Company free of charge. Success attending their enterprise has more than answered their anticipation, as testified by the large number of orders they have received, and the satisfaction expressed by the consumers. The arrangements were under the supervision of their Engineer and Manager (Mr. H. Smythe).

The Northern Coal Trade.—The northern coal trade was decidedly easier last week in most of its branches. Steam coals, owing to the lessened demand, have fallen considerably in price; best Northumbrian qualities having been sold as low as 11s. 9d. per ton free on board, which is 1s. 3d. per ton below the rate that has generally prevailed throughout the summer. Other kinds of steam coals have also fallen in proportion. Gas coals are steady for occasional cargoes—the price varying from 11s. to 11s. 6d. per ton free on board; but it seems to be generally believed that a contract for upwards of 60,000 tons of best Durham gas coals has been concluded for Genoa, at 10s. to 10s. 3d. per ton free on board. Though this is not as yet officially confirmed, there is very little doubt that the knowledge that the gas companies have considerable stocks, and the fact that the autumn has been so fine as to lessen the consumption of coal, induce coalowners to take rather lower prices than they have been asking for contracts. The household coal trade is dull, for the similar reason; and the price is barely maintained. Bunker coal is easier; as low as 9s., less discount, being taken for some fair unscreened kinds. For manufacturing fuel there is a good demand. Coke is dearer. Gas coke is being exported more; and about 13s. 6d. free on board is the price for gas coke.

Conviction for Assaulting a Non-Unionist Stoker.—At the Woolwich Police Court last Saturday, William Murphy and Michael M'Evoy, two Unionist men, were summoned for assaulting William Payne, a non-Unionist stoker employed at the Beckton Gas-Works. Mr. Humphrys said he was instructed by The Gaslight and Coke Company to prosecute. The Company were large employers of labour, and treated both Union and non-Union men alike; and they were determined to protect their stokers from molestation and ill-usage, no matter to which faction they belonged. In the present instance, the Company did not press for a heavy punishment. After hearing the evidence, the Magistrate fined Murphy 10s. and 2s. costs, and bound M'Evoy in the sum of £5 to keep the peace for three months.

Interference with Sewers by Electric Lighting Companies.—A few days ago, the Vestry of St. George-the-Martyr, Southwark, discovered that, while laying one of their mains, the Electric Supply Corporation had taken up and cut away part of a sewer which runs through Union Street, Borough. Last Wednesday, the Manager (Major C. B. Waller) appeared at the Southwark Police Court in answer to a summons, taken out at the instance of the Vestry, who also complained that the Corporation had neglected to give them notice that they intended to cut through the sewer. The Surveyor of the Vestry deposed to the fact that the size of the sewer, owing to the manner in which the defendants had repaired it, was decreased. After listening to some long legal arguments, Mr. Slade adjourned the summons for both sides to have an opportunity of referring the matter to the Board of Trade.

Shrewsbury Corporation Water Supply.—There was another long discussion at the meeting of the Shrewsbury Town Council yesterday week on the question of the water supply of the borough. The Water Committee reported that they had again fully considered their recommendations as to the improvement of the present water-works (*ante* pp. 462, 613), and had arrived at the conclusion that they were of "immediate necessity, even in view of any future scheme being considered." The adoption of the report was proposed by the Chairman (Mr. Barker), and seconded by Mr. Drayton. Mr. Evans afterwards moved a resolution, that the Council adopts the report of the Water Committee on condition that, if upon further consideration and inquiry, it was found that any less sum than £3100 was sufficient to satisfactorily ensure the convenience of a constant supply upon a temporary basis, the expenditure be reduced. Mr. Holt seconded the motion; and Mr. Barker said that he would accept it. Ultimately the proposition for the adoption of the report was agreed to with Mr. Evans's resolution as a rider.

The Dangers of Gas-Heated Baths.—Another death has been caused by a gas-heated geyser in a bath-room. The victim this time was George Arthur Bailey Croft, aged 19, son of Admiral Croft, of Manor Gate House, Kingston Hill. On Monday of last week, about 5.30 p.m., he went into the bath-room, which was fitted with a "Lightning Geyser;" and not appearing as usual at dinner an hour later, the Admiral went to the bath-room, and found him lying at the bottom of the bath (which was empty), with his face downwards and his legs drawn up. His nostrils and upper lip were black. Dr. W. R. Cooper, who was immediately called in, tried to restore animation by means of electricity and other methods; but without avail. A *post-mortem* examination revealed that death was due to asphyxia, the result of poisoning by carbonic acid gas mixed with carbonic oxide At the Coroner's inquiry on Thursday, it was stated that when the deceased was discovered, the bath-room was stifling hot, and the walls were wet with moisture, in addition to which the ceiling was black with carbon deposit. The windows were closed; and there were no proper means of ventilation. The jury returned a verdict of "Accidental death."

Opening of the Livesey Public Library in Camberwell.—Last Saturday, in the presence of a large assemblage, Sir Edward Clarke, the Solicitor-General, opened a new public library, presented to the parish of Camberwell by Mr. George Livesey. The new building, which adjoins Christ Church, in the Old Kent Road, has cost upwards of £6000; and this amount, together with the cost of the site (£1000) and the furniture, has been provided by Mr. Livesey. The building includes spacious news and reading rooms, and a hall for the meetings of working men's clubs. At present there are 6588 volumes in the lending department, and there is also the nucleus of a reference library. In the course of the inaugural proceedings Mr. Livesey delivered a short address, in which he said that, having been connected with the parish 50 years, and a resident in it 30 years, and having received much kindness from the working people, he felt it to be a duty to do something to brighten their lives; and he thought this could best be done by the establishment of a free public library. The strike of the workmen formerly in the employ of his Company had had nothing whatever to do with the matter. Mr. Whiteley, Chairman of the Commissioners of Camberwell Public Libraries, moved, in the name of the ratepayers, a vote of thanks to Mr. Livesey; and this was heartily accorded.

Conference on Suburban Water Supply.—Last Tuesday, a conference, convened by the Chairman of the Walthamstow Local Board, and attended by the Chairman of the Essex County Council, was held to consider the position of the London County Council in relation to the supply of water in the suburbs of the Metropolis. Representatives were present from Walthamstow, East Ham, Woodford, and Leyton. In view of the possible transference of the water supply of London to a central authority, the object of the conference was to decide what steps should be taken for the protection of the districts outside the area of the Metropolis. After some discussion, a resolution was unanimously adopted, declaring—"That this meeting of representatives of sanitary authorities in the county of Essex, whose districts are served by the East London Water Company, and contain a population estimated at 350,000, while entirely approving the proposal to bring the water supply of London and the sub-Metropolitan districts under one public authority, protests most strongly against that authority being the London County Council alone, and pledges itself to oppose any scheme which does not give the sub-Metropolitan districts full representation in proportion to their population." It was arranged that districts similarly situated in Middlesex, Herts, Surrey, and Kent should be invited to an early conference on the subject.

New Water-Works for Denby.—Last Thursday, Colonel C. H. Luard, R.E., one of the Inspectors of the Local Government Board, concluded an inquiry at Denby into an application of the Local Board for sanction to borrow £6000 for the purpose of constructing a reservoir of 100,000 gallons capacity, and other works for the better supply of the district with water. The inquiry was commenced on Aug. 20; but was adjourned in order that certain concessions might be made to remove opposition to the scheme. The evidence given on Thursday showed that this had been done.

Electric Light in Newcastle.—Five electric lamps have been erected in front of the Central Station at Newcastle. The pillar of each is 27 feet high; and the light emitted is said to be of 1500-candle power—making a total of 7500 candles. This, it is reported, is an increase of "6000-candle power as compared with the old system, whilst the cost is slightly under what has been previously paid for lighting." Yesterday week the members of the Lighting Committee of the Newcastle Corporation inspected the lamps, and expressed themselves well pleased with the light. A number of the ordinary gas-lamps were extinguished.

Fylde Water-Works Company.—The Directors of this Company in their fifty-second half-yearly report, to be submitted to the shareholders next Thursday, state that the capital account has been increased during the half year by an expenditure of £3568, and now amounts to £245,667. The revenue account shows that the water-rates and other receipts (including £1479, the balance brought forward) amount to £13,452—less empty houses and bad debts (£373), £13,078. The interest on loans and bank commission amounted to £998; sinking fund account, £250; and working expenses, rents, rates, and taxes, £2744—leaving a balance of £9085. The Directors recommend a dividend at the rate of 8½ per cent. per annum on stock "A," free of income-tax, and 7 per cent. per annum on stock "B," less income-tax; leaving a balance of £2390. Of this amount they recommend £1000 to be added to the reserve fund, making it £11,000.

The Recovery of Gas and Water Rates.—At the Mistley Petty Session, on Monday of last week, Mr. Charles C. Monro, Solicitor, of Clacton-on-Sea, was summoned for the non-payment of gas and water rates, amounting to £19 7s. 8d.—gas £14 7s. 6d.; and water, £5 0s 2d. The matter had been twice previously adjourned. Mr. T. H. Baker, Manager of the Clacton-on-Sea Gas and Water Company, said that the amount was made up of a rate made on June 24 and arrears. The Magistrates' Clerk (Mr. W. Mustard) said he had been in correspondence with the Solicitors to the Company; and he had explained to them that, under the Summary Jurisdiction Act, they could only recover for six months. Mr. Baker thereupon detailed the amounts due for the six months; and the Magistrates' Clerk said that was all that could be recovered, and quoted the section of the Act bearing on the matter. Mr. Baker contended that this applied to debts recoverable against the Company. The amounts due from the defendant for his house and office, for the six months, came to £5 10s. 1d. for gas, and for water, £2 2s. 2d.—in all £7 12s. 3d.; and an order was made by the Bench for the payment of this amount, together with the costs of the hearing and one adjournment, making a total of £8 8s. 3d.

The Public Lighting of Lewes.—The adjourned public meeting to consider questions concerning the public lighting of the borough was held at Lewes last Wednesday. The Mayor (Alderman White) presided. In his opening remarks, he stated that, since the last meeting (*ante*, p. 756), he and Alderman Farncombe had visited Bath and Taunton, to see the electric light installations there. Personally he was favourably impressed with what he saw. At the latter place the Electric Light Company were supplying arc lamps burning from dusk until eleven o'clock, at £13 per lamp per annum. This sounded a large figure; but it must be remembered thay they had a vastly superior light to that obtained from the gas-lamps for which in Lewes they were paying £3 12s. 6d. per annum, and, naturally, would not need so many. He had hoped that what transpired at the last meeting would have induced the Gas Company to lay before the Council some more liberal offer. He believed the ratepayers at the last meeting were told that the Council was awaiting a reply from the Company as to the charge they wonld make for a temporary continuance of the lighting either for six or twelve months; but he found, from one of the local papers, that they would only be willing to supply gas at 3s. 7d. per 1000 cubic feet, and furnish standards and lamps, the gas to be supplied through meters placed in various parts of the town. The Corporation were to provide burners, light, extinguish, and clean the lamps, and pay a small quarterly sum for the hire of the plant. These terms, in reality, were not so good as those they had under consideration at the last meeting. If the Corporation undertook the whole management of the public lamps, and provided burners, there would be an expense of some £150 a year. If they relieved the Company of this burden, surely they ought to be able to proportionately lessen the price of gas. Mr. J. G. Braden spoke against the condemnation which had been thrown upon the illuminating power of the gas in the town. This, he was assured, was always kept up to the standard; and it appeared to him that a great deal of the want of illumination was due to the sparse number of gas-lamps distributed about the town. Colonel Chatfield, while advocating the use of electric lighting for street purposes, expressed the opinion that both the gas and water works should be in the hands of the Council. Mr. Wells urged the Corporation to postpone the adoption of any system of electric light until the installations now being constructed by the local authorities of St. Pancras and Brighton had been in work a sufficient time for the results to be accurately known, and to endeavour to obtain better terms from the Gas Company for the next three years. He moved an amendment to this effect, which was seconded by Mr. Morrish. A further amendment—that the Town Council proceed with the lighting by electricity—was proposed and seconded. The Rev. Dr. Cross agreed with the latter amendment to a certain extent; but it seemed to him rather an arbitrary way of showing to the Town Council the wishes of the ratepayers. The amendment was then framed so as to read: "That the Corporation be asked forthwith to make inquiries with a view of lighting the town by electricity;" and in this form it was carried by an overwhelming majority. A poll of the town on the question was demanded, and was almost unanimously supported by the meeting.

Long Eaton Water Supply.—The Long Eaton Local Board have applied to the Local Government Board for sanction to borrow £39,000 for works of water supply. Before granting their consent, however, the latter body have requested the Local Board to furnish them with some information relative to the water proposed to be supplied.

The Gas Question at Mexborough.—Regarding the agitation as to the quality and quantity of the gas supplied by the Mexborough Gas Company, the inhabitants of Swinton have followed the example set at Mexborough, and numerously signed a requisition in favour of better and cheaper gas. Last Thursday a meeting of tradespeople and others was held at Mexborough to protost against the gas supply. A resolution was passed to the effect that the price ought to be lower than 3s. 6d. per 1000 feet, and the gas of better quality; and that the proceedings be adjourned in order to receive a reply from the Gas Company. A suggestion that a gas inspector should be appointed was adopted. The illuminating power of the gas, report says, is better than it was a few weeks ago; but the concensus of opinion is that it is by no means satisfactory.

Liability for Defective Water-Pipes.—At the North London Police Court yesterday week, one of the applicants before Mr. Bros was a man who said he had had no supply of water at his house for the past two weeks. A water-pipe connecting his house with the main had burst, and he then wrote to the Water Company. The Company sent a notice to him, calling upon him to have the pipe repaired within 24 hours. He sent this to the agent of his landlady; but no notice was taken of it. The Company sent the next day and cut off the supply; and he had been without water ever since—the sanitary authorities having failed to compel the landlady to repair the pipe. That morning the agent had come for the rent; but he (applicant) wanted now to know if he was bound to pay rent for a house in which he had no water to use. Mr. Bros said that the proper thing for him to have done was to have had the pipe repaired, and deducted the cost from the rent. Applicant remarked that the agent said he would distrain if he did not pay. Mr. Bros said the applicant would have to pay; and he could do as he had been told with regard to the water-pipe. Applicant questioned whether the Company were within their rights in cutting off the supply; but the Magistrate assured him that they were.

GAS AND WATER COMPANIES' STOCK AND SHARE LIST.

(For Stock Market Intelligence, see ante, p. 843.)

Issue.	Share	When ex-Dividend.	Dividend or Div. & Bonus.	NAME.	Paid per Share	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p. c.	GAS COMPANIES.				£ s. d.
590,000	10	10 Oct.	10½	Alliance & Dublin 10 p. c.	10	16–17½	–1	6 3 6
100,000	10		7½	Do. 7 p. c.	10	12–13*	–½	5 15 6
300,000	100	1 July	5	Australian (Sydney) 5 % Deb.	100	107–109	..	4 11 9
100,000	20	30 May	8	Bahia, Limited	20	20–22	..	7 5 5
200,000	5	15 May	7½	Bombay, Limited	5	6¾–7¼	–¼	5 3 5
40,000	5	,,	7½	Do. New	4	5–5½	..	5 9 1
380,000	Stck.	14 Aug.	12½	Brentford Consolidated	100	212–217	..	5 12 11
125,000	,,	,,	9½	Do. New	100	155–160	..	5 15 7
220,000	20	11 Sept.	11½	Brighton & Hove Original	20	40–42	..	5 9 6
320,000	20	28 Mar.	11½	British	20	43–45	..	5 0 0
50,000	10	11 Sept.	11	Bromley, Ordinary 10 p. c.	10	18–20	..	5 10 0
39,000	10	,,	8	Do. 7 p. c.	10	13–14	..	5 14 3
328,750	10	13 June	8	Buenos Ayres (New) Limited	10	12–13	–½	6 3 1
200,000	100	1 July	6	Do. 6 p. c. Deb.	100	103–106	..	5 13 2
150,000	20	14 Aug.	8	Cagliari, Limited	20	25–27	..	5 18 4
550,000	Stck.	10 Oct.	13½	Commercial, Old Stock	100	245–250*	..	5 10 0
130,000	,,	,,	10½	Do. New do.	100	198–203*	..	5 5 11
130,000	,,	27 June	4½	Do. 4½ p. c. Deb. do.	100	119–124	..	3 12 7
557,320	20	13 June	13	Continental Union, Limited	20	49–51	..	5 1 11
242,680	20	,,	13	Do. New '69 & '72	14	34–36	+1	5 1 6
200,000	20	,,	10	Do. 7 p. c. Pref.	20	39–41	..	4 17 7
75,000	Stck.	25 Sept.	10	Crystal Palace District	100	190–200	..	5 0 0
234,060	10	16 July	—	European, Limited	10	18–20	..	—
120,000	10	,,	—	Do. New	10	18–20	..	—
354,060	10	,,	—	Do. do.	7½	14–15	..	—
5,470,620	Stck.	14 Aug.	13	Gaslight & Coke, A, Ordinary	100	235–239	+2	5 8 10
100,000	,,	,,	4	Do. B, 4 p. c. max.	100	98–101	..	3 19 3
665,000	,,	,,	10	Do. C, D, & E, 10 p.c. Pf.	100	247–252	–3	3 19 4
30,000	,,	,,	5	Do. F, 5 p. c. Prf.	100	119–123	..	4 1 3
60,000	,,	,,	7½	Do. G, 7½ p. c. do.	100	177–182	..	4 2 5
1,300,000	,,	,,	7	Do. H, 7 p. c. max.	100	164–168	..	4 3 4
463,000	,,	,,	10	Do. J, 10 p. c. Prf.	100	246–251	–4	3 19 8
1,061,150	,,	13 June	4	Do. 4 p. c. Deb. Stk.	100	115–120	..	3 6 8
294,850	,,	,,	4½	Do. 4½ p. c. do.	100	123–128	..	3 10 4
650,000	,,	,,	6	Do. 6 p. c. do.	100	161–166	..	3 12 3
3,800,000	Stck.	15 May	12	Imperial Continental	100	220–223	..	5 7 7
75,000	5	13 June	6	Malta & Mediterranean, Ltd.	5	5½–5¾	..	5 4 4
560,000	100	1 Oct.	5	Met. of Melbourne, 5 p. c. Deb.	100	109–111	..	4 10 1
541,920	20	13 June	6½	Monte Video, Limited	20	19¾–20½	..	6 6 10
150,000	5	30 May	10	Oriental, Limited	5	9–9¼	..	5 5 3
60,000	5	25 Sept.	7	Ottoman, Limited	5	5–5⅜	..	7 7 3
166,870	10	16 July	4	Pará Limited	10	3½–4¾	..	8 17 9
420,000	100	2 May	6	People's Gas of Chicago—1st Mtg. Bds.	100	98–102	..	5 17 8
500,000	100	2 Dec.	6	2nd Do.	100	95–100	..	6 0 0
150,000	10	10 Oct.	10	San Paulo, Limited	10	15–16*	..	6 5 0
500,000	Stck.	28 Aug.	13½	South Metropolitan, A Stock	100	283–288	..	4 12 0
1,350,000	,,	,,	11½	Do. B do.	100	227–232	..	4 19 1
141,500	,,	,,	12	Do. C do.	100	235–245	..	4 17 11
650,000	,,	27 June	5	Do. 5 p. c. Deb. Stk.	100	142–147	..	3 8 0
60,000	5	11 Sept.	11½	Tottenham & Edm'nton, Orig.	5	11–13	..	4 8 5
				WATER COMPANIES.				
728,446	Stck.	13 June	9½	Chelsea, Ordinary	100	269–274	..	3 9 4
1,720,560	Stck.	10 Oct.	7½	East London, Ordinary	100	209–213	..	3 10 5
544,440	,,	27 June	4½	Do. 4½ p. c. Deb. Stk.	100	140–145	..	3 2 0
700,000	50	13 June	9	Grand Junction	50	120–124	..	3 12 7
708,000	Stck.	14 Aug.	10½	Kent	100	270–275	..	3 16 4
1,043,800	100	27 June	9½	Lambeth, 10 p. c. max.	100	249–254	..	3 14 9
406,200	100	,,	7½	Do. 7½ p. c. max.	100	197–202	..	3 14 3
225,000	Stck.	25 Sept.	4	Do. 4 p. c. Deb. Stk.	100	120–124	..	3 4 6
500,000	100	14 Aug.	12½	New River, New Shares	100	361–366	..	3 6 3
1,000,000	Stck.	31 July	4	Do. 4 p. c. Deb. Stk	100	125–128	..	3 2 6
902,300	Stck.	13 June	6	S'thwk & V'xhall, 10 p. c. max.	100	170–174	..	3 9 0
126,500	100	,,	6	Do. 7½ p. c. do.	100	158–163	..	3 13 7
1,155,066	Stck	13 June	10	West Middlesex,	100	265–270	..	3 14 1

*Ex.div.

The Central Co-Operative Stores.—Some months ago we noticed on the site of the old Holborn Amphitheatre the opening of the Central Hall, in Holborn. The spacious hall has lately undergone transformation, and has now become the Central Co-Operative Stores. There are 34 departments ranged on the ground floor and galleries. The Wenham Company have 120 of their regenerative lamps in use; the kitchen is fitted with a Wilson Engineering Company's gas cooker and baker's oven, together with a very large hot-plate; and Messrs. Crossley Bros. have erected a 2-horse power "Otto" gas-engine, which is used for mincing.

The Lancashire Coal Trade.—Business in the coal trade during the past week was anything but brisk; and in some directions there has been a slight concession upon rates current in the previous week. Generally, quotations remain without change; but there is a want of firmness in the market. At the pits, best house coal averages from 12s. to 12s. 9d. per ton; second qualities, from 10s. 6d. to 11s.; and common round, 9s. to 9s. 6d. Burgy sells at 7s. 6d. to 8s. per ton; best slack, from 7s. to 7s. 6d.; and inferior sorts from 5s. to 6s. 6d. Good ordinary qualities of steam coal for shipment are selling better, and prices are firm at 10s. 6d. to 10s. 9d. per ton delivered at the docks at Liverpool.

Gas Workers' Grievances at Belfast.—The dispute which has existed for some time between the Belfast Corporation Gas Committee and a number of the men employed at their works has been amicably arranged. A meeting of the Committee was held last Thursday, when a deputation from the men was present. After some discussion, it was decided that a month's engagement should be signed by the men on entering the works, and that a month's notice should be given of their determination to leave their employment. This, of course, does not affect cases of misconduct or inability to discharge their duties, as such would be met by immediate dismissal. All who have signed for longer terms can, if they wish, adopt the new system; but in doing so they will lose the bonus attached to the former. This final adjustment of the existing differences, it is understood, has met with general approval.

The Abolition of Gas-Meter Rents at Leigh.—The decision of the Leigh Local Board to abolish the payment of meter hire (referred to in a recent issue of the JOURNAL) has already been the means of largely increasing the number of gas consumers in the district. In March last there were 2315 consumers; and the number is now upwards of 2500, with the certain prospect of considerable additions during the coming winter months. At present there are within the Board's district 1397 houses that have the usual supply-pipes, though not using gas; and it is believed that many of these will shortly have meters put in, now that the charge has been abandoned. The change will entail a loss of about £400 on the Board; but it is expected that this will soon be made up in the increased consumption of gas. The practical effect of the Board's action is that gas is obtained at a cheaper rate, or equal to a reduction in price of 3d. per 1000 cubic feet.

The Water-Works Companies' Investment Trust, Limited.—A Company under this title was registered last week, with a capital of £252,000, divided into 250,000 ordinary and 2500 founders' shares of £1 each, to "lend upon the security of, and invest money in, the bonds, debentures, debenture stock, obligations, or other securities, or shares or stock, of any company, corporation, *société anonyme*, association, undertaking, or public or private body (English, Indian, Foreign, or Colonial), formed to carry on, or carrying on, the business of the supply of water of all descriptions and for all purposes, either in the United Kingdom or in any other part of the world, and to sell or dispose of the same, and to re-invest upon any of such securities." Among the first subscribers is Sir W. Guyer Hunter, K.C.M.G., M.P., the Chairman of the Special Committee appointed by the Corporation of London to inquire into the water supply of the Metropolis.

GWYNNE & BEALE'S PATENT GAS EXHAUSTERS AND ENGINES.

Telegrams: "GWYNNEGRAM LONDON." TELEPHONE No. 2698.

GWYNNE & CO.,

HYDRAULIC AND GAS ENGINEERS,

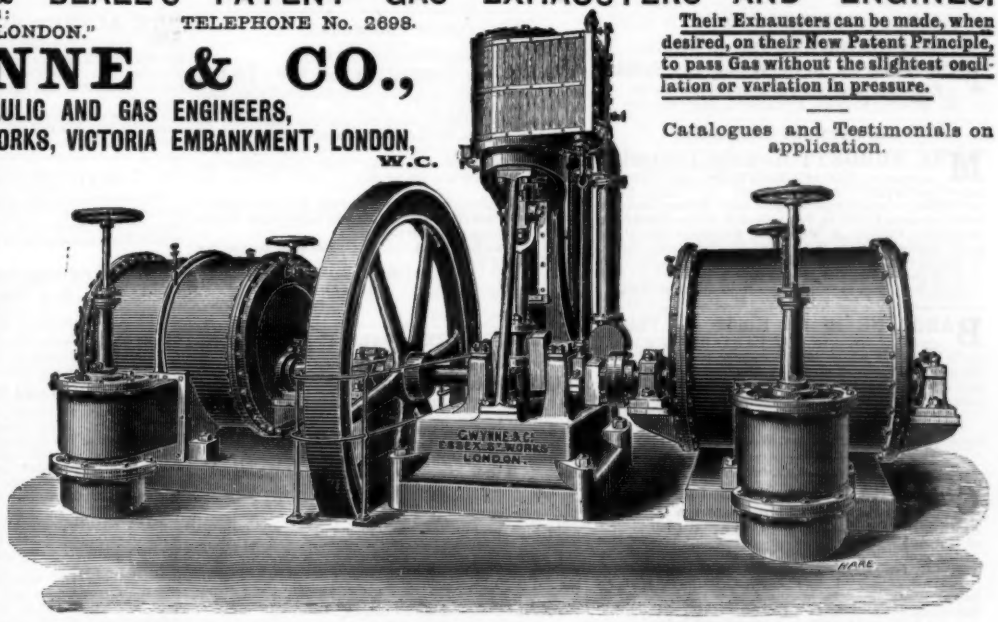
ESSEX STREET WORKS, VICTORIA EMBANKMENT, LONDON, W.C.

Thirty-three Medals at all the Great International Exhibitions have been awarded to GWYNNE & Co. for Gas Exhausters, &c.

They have completed Exhausters to the extent of 29,000,000 cubic feet passed per hour, which are giving unqualified satisfaction in work.

Makers GAS-VALVES, HYDRAULIC REGULATORS, VACUUM GOVERNORS, STEAM-PUMPS for Tar, Liquor, or Water; CENTRIFUGAL PUMPS and PUMPING ENGINES, specially adapted for Water-Works, raising Sewage, &c.

Also GIRARD and other TURBINES, HIGH-SPEED ENGINES, DYNAMOS, &c., &c., for ELECTRIC LIGHTING.



Their Exhausters can be made, when desired, on their New Patent Principle, to pass Gas without the slightest oscillation or variation in pressure.

Catalogues and Testimonials on application.

Exhausting Machinery at Fulham and Bromley Gas-Works—each set passing 400,000 cub. ft. per hour, drawing 14 miles distant from Beckton.

NOTICE TO ADVERTISERS.—COPY FOR ADVERTISEMENTS for the "JOURNAL" should be received at the Office *not later* than TWELVE O'CLOCK NOON ON MONDAY, to ensure insertion in the following day's issue.

Orders for Alterations in, or Stoppages of PERMANENT ADVERTISEMENTS should be received not later than the FIRST POST on SATURDAYS.

OXIDE OF IRON.

O'NEILL'S Oxide has a larger annual sale in the United Kingdom than all other Oxides combined. Purity and uniformity of quality guaranteed. Pamphlet, "How to Purchase Bog Ore," to be obtained on application.

Gas Purification and Chemical Company, Limited, Palmerston Buildings, Old Broad Street, London, E.C.
JOHN WM. O'NEILL, Managing Director.

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JOHN ROMANS & SON, EDINBURGH. Gas Engineers, supply all the most approved SCOTTISH CANNELS; also FIRE-CLAY GOODS, CAST-IRON PIPES, and other APPARATUS for GAS AND WATER WORKS.

Prices, &c., will be forwarded on application to No. 80, ST. ANDREW SQUARE, EDINBURGH, / NEWTON GRANGE, NEAR DALKEITH, } SCOTLAND.

JOHN RILEY & SONS, Chemical Manufacturers, Hapton, near Accrington, are MAKERS of SULPHURIC ACID, from Brimstone, for Sulphate of Ammonia making. Highest percentage of Sulphate of Ammonia obtained from the use of this Vitriol. References given to Gas Companies.

SULPHURIC ACID delivered in Manufacturers' Tanks or Carboys.

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JAMES LAWRIE & CO. supply Best SCOTCH CANNEL COALS, Best FIRE-CLAY RETORTS, BRICKS, TILES, and LUMPS; BOILER SEATING BLOCKS, FLUE COVERS, and SILICA BRICKS for SPECIAL FURNACE WORK; COKE BARROWS, BOGIES, and SMALL WAGONS.

Postal Address: 1, WHITTINGTON AVENUE, E.C.
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W. C. HOLMES & Co., Huddersfield, AND 80, CANNON STREET, LONDON, Contractors for Gas-Works complete, Makers of Gasholders, Purifiers, Scrubbers, Condensers, Retort Fittings, &c., Improved Valves, Engines, and Exhausters. Also for Collingwood's Regenerative Retort-Settings.

*** See Advertisement p. 869 of this week's issue.

Cablegrams: "Ignitor London." Telegrams: "Holmes Huddersfield."

J. & J. BRADDOCK, Globe Meter Works, Oldham.

First-Class Award, Melbourne Exhibition, 1889, for WET AND DRY GAS-METERS, STATION METERS, AND GOVERNORS, PRESSURE-GAUGES, STREET LAMPS AND PILLARS, &c.

Telegraphic Address: "Braddock, Oldham."

TAR and Liquor wanted.

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BALE, BAKER, & CO., direct Importers from Ireland. Sample and Price on application. Spent Oxide and Sulphate of Ammonia purchased. 120 and 121, NEWGATE STREET, LONDON, E.C.

SULPHURIC ACID.

JOHN NICHOLSON & SONS, Chemical Works, LEEDS, specially produce this ACID from BRIMSTONE, for making SULPHATE OF AMMONIA of high quality and *good* colour. Delivery in our own Railway Tank-Wagons or Carboys. Highest references and all particulars supplied on application.

COZE'S Automatic Apparatus for CHARGING AND DISCHARGING GAS-RETORTS. For Illustrated Advertisement of this System, see p. 780.

Inquiries should be addressed to THE AUTOMATIC COAL-GAS COMPANY, LIMITED, 86-88a, LEADENHALL STREET, E.C.

EXTRACT from the Harrogate Gas Company's Report, dated the 5th of February, 189 : Coal consumed, 8600 tons. Gas made, 92,880,000 feet; ditto sold, 84,880,000 feet; ditto unaccounted for, 8,000,000 feet; quantity made per ton, 10,800 feet; ditto sold, 9869 feet. Illuminating Power, 16·1 candles. Coals used, Brancepeth. Owners, Strakers and Love, Newcastle-on-Tyne; who have also Brandon Hutton Seam Unscreened Gas Coal. Analysis, 10,500 cubic feet per ton; Illuminating Power, 16·2 candles.

WANTED, by a Competent Man, a Situation as SERVICE LAYER, METER FIXER, INDICE READER, MAIN TESTER, &c. Fifteen years' experience in general outside work. Eleven years at last situation.
Address J. K., 14, Station Street, STRATFORD, E.

WANTED, by a young Man, a Situation as MAIN and SERVICE LAYER, and METER FIXER. Can repair Dry Meters, understands House Fitting, and willing to make himself useful on the Works. Good references. Aged 24.
Apply to G. KNEALE, care of Mr. Pettit, High Street, Bexhill, SUSSEX.

OAKHAM GAS COMPANY.

WANTED, a married Man as Working MANAGER, FITTER, and COLLECTOR. Security required, £100. Free Residence, large Garden, Coal, &c., at the Works.
Apply, stating age, experience, and qualifications, with testimonials, to the SECRETARY, 42, Belvoir Street, LEICESTER.

WANTED, to purchase Gas Carbon, delivered at nearest Station to Gas-Works, in quantities of not less than 4 tons.
Address, stating price per ton and quantity, No. 1766, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

RETORT CARBON wanted, by a London Firm, in quantities of from 2 to 3 tons per month. Send prices, &c., to No. 1871, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

FOR SALE—A Bargain. One 6-inch GOVERNOR complete, with 6-inch Inlet, Outlet, and Bye-Pass Valves. Equal to New. Has been replaced by a larger one. Price £10 10s.
Apply to the MANAGER, Gas-Works, Ware, HERTS.

BENTLEY & CO.

MANCHESTER ELECTRICAL STORES.

FOR Batteries, Bells, Wires, and Special Electrical Apparatus, address the best house 17, NEWTON STREET, PICCADILLY, MANCHESTER.

GAS LAUNDRY LECTURES.

MRS. BURDETT (Laundry Instructor) is open to ENGAGEMENTS for LECTURING on "LAUNDRY APPLIANCES for GAS CONSUMERS," demonstrating the new Steam-Washers, which cleanse Linen in Ten minutes, without Rubbing, Scrubbing, Boiling, or Maiding. Fixtures: Wartburg Hall, Denmark Hill, Oct. 8 and 9; Rampant Horse, Norwich, Oct. 10 and 11 (second lecture); St. George's Hall, Wandsworth, Oct. 28 and 29.
Apply for terms to 32, Melford Road, FOREST HILL

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Price 2s. per dozen, or 10s. 6d. per 100, post free.

CONSPIRACY and Protection of Property Act. It is required, under a Penalty of FIVE POUNDS, that a Printed Copy of the 4th Section of this Act shall be posted up at all Gas-Works, in a conspicuous place, where the same may be conveniently read by the persons employed thereat.
Printed copies of this Section, in large type, on broad sheets, may be obtained of WALTER KING, 11, Bolt Court, FLEET STREET, E.C.
*** *The Act extends to Scotland and Ireland.*

SPENT OXIDE.

THE Winchester Water and Gas Company have FOR SALE about 40 tons of SPENT OXIDE.
Samples can be obtained of, and offers (on rail at Winchester) should be made to
W. UPTON TINNEY, Manager.

CORPORATION OF NELSON.

TO MANUFACTURING CHEMISTS.

THE Nelson Gas Committee are prepared to receive TENDERS for the purchase of the surplus TAR produced at their Works during the year ending Oct. 31, 1891.
Particulars and forms of tender may be obtained on application to the Gas Manager, Mr. William Foster.
Tenders, endorsed "Tar," to be sent to me on or before Wednesday, Oct. 22.
By order,
R. M. PRESCOTT,
Town Clerk.
Town Hall, Nelson, Oct. 7, 1890.

ULVERSTON LOCAL BOARD.

TENDERS FOR COAL.

THE Gas and Water Committee invite TENDERS for the supply of 1000 tons of best screened GAS COAL, to be delivered between December, 1890, and June, 1891, in such quantities as may be required by the Manager.
Parties tendering must give full particulars of the Coal they propose to supply, and name the pit from which it will be raised.
Further information and forms of tender may be obtained on application to the undersigned.
Tenders to be sent in not later than the 30th inst., addressed to the Chairman of the Gas and Water Committee, and endorsed "Tender for Coal."
The Committee do not bind themselves to accept the owest or any tender.
JNO. SWAN,
Engineer and Manager.

TIPTON GAS-WORKS.

TO GASHOLDER MAKERS.

THE Gas Committee of the Tipton Local Board are prepared to receive TENDERS for the construction and erection of a DOUBLE LIFT TELESCOPIC GASHOLDER, 100 feet diameter by 25 feet deep, with Wrought-Iron Guide-Framing.
Drawings and specification may be seen, and other particulars obtained, at the Gas-Works (on and after the 18th inst.) on application to Mr. Vincent Hughes, the Engineer.
Sealed Tenders, endorsed "Tender for Gasholder," to be sent to me the undersigned not later than Three p.m. on Monday, the 27th inst.
The Committee do not bind themselves to accept the lowest or any tender.
By order,
GEO. M. WARING,
Clerk to the Board.
Tipton, Oct. 11, 1890.

BRISTOL UNITED GASLIGHT COMPANY.

TENDERS FOR TAR.

THE Directors of the above Company invite TENDERS for the purchase of the TAR to be produced at all or either of their three Stations during a period of One, Two, or Three years, commencing on the 1st day of January, 1891.
The Annual Quantities of Tar produced at each of the Stations at present are approximately as follows:—

Avon Street	530,000 gallons.
Canons' Marsh	490,000 "
Stapleton	550,000 "

Further particulars, with forms of tender, may be obtained on application to the undersigned, to whom also tenders, sealed, and endorsed "Tender for Tar," must be delivered not later than Ten a.m., on Monday, the 3rd day of November.
JAS. V. GREEN, Secretary.
Gaslight Offices, Canons' Marsh,
Bristol, Sept. 10, 1890.

PURIFYING OXIDE.

THE Dukinfield Local Board have on SALE 50 tons of SPENT OXIDE, samples of which may be had on application; and they require TENDERS for 50 tons of FRESH OXIDE.
Offers and tenders to be sent in by Saturday, the 25th of October, 1890.
HARRISON VEEVERS,
Engineer and Manager.

TO INVESTORS.

THE Directors of the Town and County of Poole Gas and Coke Company, Limited, have FOR DISPOSAL 23 4 per cent. PREFERENCE "C" SHARES of £10 each.
This being a safe Investment, early application should be made to the Secretary, who will supply all particulars.
By order.
WILLIAM DAVIS, Secretary.
Gas Office, Poole, Oct. 7, 1890.

BRISTOL WATER-WORKS COMPANY.

AUTHORIZED CAPITAL, £1,705,000.

SALE BY TENDER OF £50,000 7 PER CENT MAXIMUM ORDINARY STOCK.
MINIMUM PRICE, £140 PER CENT.

THE Company are prepared to receive TENDERS for the above STOCK on or before the 14th of November, 1890. The Stock to be paid up in full by the 31st of December, 1890.
Particulars and conditions of sale and forms of tender can be obtained at the Company's Office, Small Street, Bristol.
By order.

WEST HAM GAS COMPANY.

SALE OF 1250 SHARES.

MR. ALFRED RICHARDS is favoured with Instructions from the Directors to SELL BY AUCTION, at the Mart, Tokenhouse Yard, E.C., on Tuesday, Nov. 4, at Two o'clock precisely, in lots of 10 Shares each, 1250 £10 SHARES in the West Ham Gas Company.
The Standard Dividend authorized by the Company's Act of Parliament is 7 per cent.; but a reduction of 3d. per 1000 cubic feet below the standard price of gas having been made, it would, under the Sliding-Scale Clauses, be competent for the Shareholders to declare a Dividend of 7¼ per cent. in respect of these Shares.
Particulars may be obtained at the MART; of the SECRETARY to the COMPANY, STRATFORD, E.; of Messrs. HILLEARY, Solicitors, 5, FENCHURCH BUILDINGS, E.C. and of the AUCTIONEER, 8, NEW BROAD STREET, E.C.

BY ORDER OF THE TRUSTEES OF THE LATE R. J. DICKINS, ESQ.

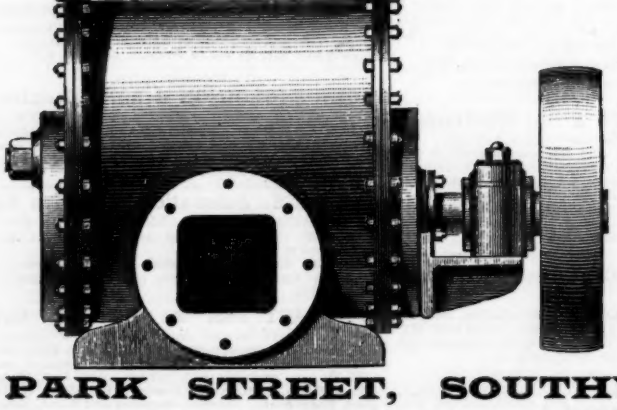
CROYDON GAS COMPANY.

Sale of 632 Shares in the Croydon Gas Company, producing Dividends at the rate of 14 and 11 per cent. per annum respectively.

THURGOOD and MARTIN have received instructions to SELL BY AUCTION at the Greyhound Hotel, High Street, Croydon, on Thursday, Nov. 6, 1890, at Six o'clock precisely, in 64 Lots, *cum div.*, 294 SHARES (£5 fully paid), producing Dividends at the rate of 14 per cent. per annum, and 338 SHARES (£5 fully paid), producing Dividends at the rate of 11 per cent. per annum, all in the Capital of the Croydon Gas Company.
An excellent opportunity for the secure investment of large or small sums; the Dividends being well secured against fluctuation by ample Reserve and Insurance Funds.
Particulars and conditions of sale may be had of Messrs. LOVELL, SON, and PITFIELD, Solicitors, 3, GRAY'S INN SQUARE, W.C.; at the place of Sale; and of the AUCTIONEERS, 27, CHANCERY LANE, W.C.

G. WALLER & CO.'S
PATENT FOUR AND THREE BLADE GAS EXHAUSTERS.

With or without Engine combined. To pass up to 300,000 cubic feet per hour. Nearly 200 in use and on order. Model sent for inspection.



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1. It gives a more **steady gauge** at all speeds than any other Exhauster.
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5. No **heavy Fly-Wheel** needed; and **one-third less** power required.
6. The **only system** by which Exhausters **can be altered** to pass from **30 to 40 per cent.** more with same Driving Gear and Connections.

Oldest Makers of BEALE'S EXHAUSTERS for 300 Works.

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Is Weck's Patent arrangement of Three-Way Disc Valves, either separate for Purifiers fixed in line, or arranged together as a

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When the Purifiers are fixed in square.

No Leakage. No Foul Gas passed in changing. All the Purifiers in action, or any less number. Clean Box emptied of Air before taking into use.

DESCRIPTIVE PAMPHLET ON APPLICATION.

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PARIS DEPOT: 3, BOULEVARD DE BELLEVILLE.

HOLMSIDE GAS COALS.

THE Owners of Holmside and South Moor Collieries possess an undivided area of nearly 5000 acres of COAL in the County of Durham, over the greater portion of which area the most of the best Coal of the district, including the well-known Hutton Seam, remains almost untouched; and as preparations are being made for working the Hutton Seam on a large scale, it is expected that the reputation of HOLMSIDE GAS COALS will be still further increased. The Holmside and South Moor Collieries have been in the hands of the same families for over half a century; but, until lately, no adequate attempt has been made to open out their very large Coal-Field, notwithstanding that the best Coal of the district around them, and especially the Hutton Seam, has been for some time past seriously diminished by reason of the vigorous workings of neighbouring coal-owners. Holmside Gas Coals are now being worked out of Holmside and South Moor Collieries at a rate of about 2200 tons per working day—a rate totally inadequate to meet the existing demand. By an extensive development of workings in the Hutton Seam, it is hoped that the demand may be fully met, and the quality raised to the highest point attainable by Durham Coal.

For price and particulars, apply to MARK ARCHER, Holmside and South Moor Offices, Quayside, NEWCASTLE-ON-TYNE.

Price 6s., Cloth Bound, Bevelled Boards,

THE

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CHIEFLY RELATING TO

STRAINS IN STRUCTURES CONNECTED WITH GAS-WORKS.

BY

F. SOUTHWELL CRIPPS, Assoc. M. Inst. C.E.

Reprinted from the JOURNAL OF GAS LIGHTING. *Fully Revised and Corrected by the Author, with many Additions.*

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Compiled and arranged by **ALFRED LASS,** Fellow of the Institute of Chartered Accountants.

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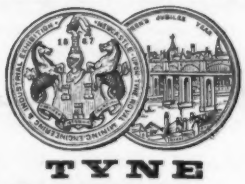

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Yield of Gas per ton	13,155 cub. ft.
Illuminating Power	38·22 candles.
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Yield of Gas per ton	10,500 cub. ft.
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By this process there is obtained—
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Which represents a saving of **One Million Sterling** per Annum to Gas Companies in the United Kingdom alone.

This System is being largely adopted at several places on the Continent and in America, and at various Gas-Works in England—notably at the Works of The Gaslight and Coke Company, the South Metropolitan Gas Company, and the Brentford Gas Company.
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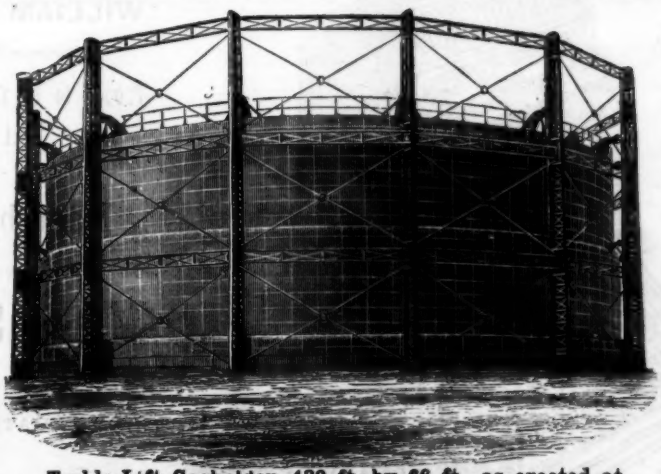

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PREPAYMENT GAS-METER.

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This Meter has a simple Automatic arrangement fitted, whereby, upon the insertion of a shilling, a supply of gas can be obtained, and which is cut off on the quantity paid for being consumed. The Meter gives warning when the quantity is nearly exhausted, so that another shilling may be inserted. There is, however, no occasion to wait until this happens, as a second shilling can be inserted after two-pennyworth of the first shilling has been consumed.

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Made in two sizes 24 and 28 inches wide over base.

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ALDWARKE MAIN GAS COAL

Analysis: 12,600 feet of 19-candle gas per ton.
Weight of illuminating power in pounds of sperm, 820·80. Very free from impurities.
Telegrams: "ATLAS SHEFFIELD."

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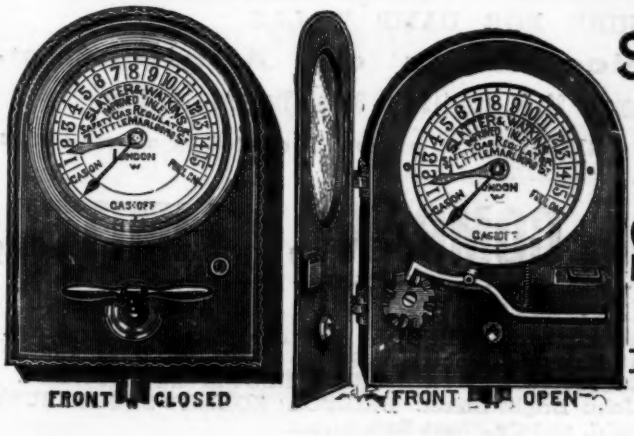

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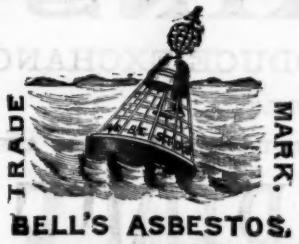

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IS FIRE RESISTING.
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IS NON-POISONOUS.
IS MANUFACTURED IN ALL USEFUL COLOURS.
IS IMPERVIOUS TO HEAT, COLD, OR WATER.
IS WITHOUT SMELL.

No expensive Oil or Turpentine required.

WILL NEVER BLISTER.

HAS A COVERING CAPACITY 40 PER CENT. GREATER THAN LEAD PAINTS.

For Outside or Inside Work in any Climate.

Bell's Asbestos Aquol Paint is equally suitable for the finest decorative work as well as for general painting. It can be applied over or under any other paint, and, owing to its easy application, can be used with a large distemper brush; the SAVING THUS EFFECTED IN LABOUR BEING **50** PER CENT. OVER THAT OF LEAD PAINTS.

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BELL'S ASBESTOS AQUOL PAINT is specially adapted for Private Houses, Exhibition Buildings, Ships, Churches, Asylums, School Boards, Railway Stations, and all work of Wood, Iron, Cement, Plaster, Stone, Brick, &c., &c.

Those who Study Economy and Protection from Fire should use only

BELL'S ASBESTOS AQUOL PAINT.

BELL'S ASBESTOS AQUOL PRIMING is made Ready for Use.
BELL'S ASBESTOS AQUOL PRIMING stops all suction of Wood, Cement, Plaster, &c.
BELL'S ASBESTOS AQUOL PRIMING should be applied to all New Work.

Suitable for Ceilings, Walls, and New Wood, and is very durable.

BELL'S ASBESTOS AQUOL KNOTTING, for Stopping Knots in New Work.

AN EXCELLENT CURE FOR DAMP WALLS.

Colour Cards and Price Lists on Application.

Supplied in Casks of 5 to 7 cwt., and Iron Drums of 28, 56, and 112 lbs., Sample Tins of 7 and 14 lbs.

Owing to its Covering Capacity, a SAVING IN FREIGHT of 40 per cent. is effected for a given surface.

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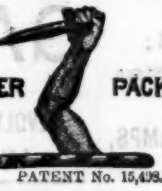
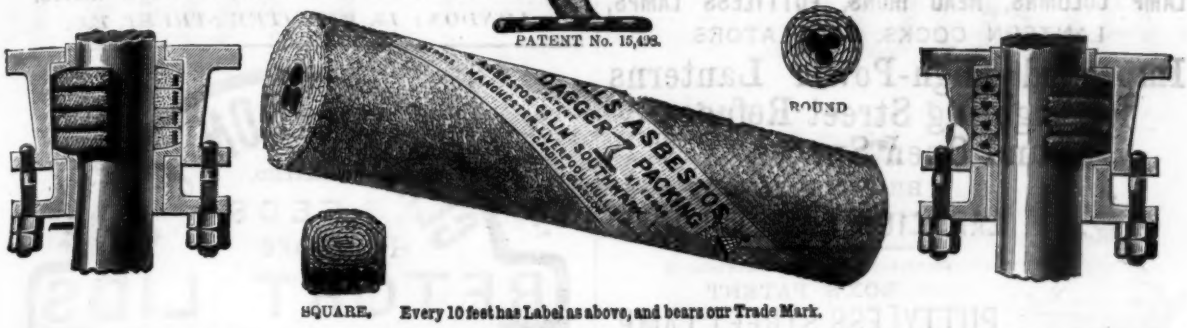
AGENTS—BIRMINGHAM: BELL and Co., 7, John Bright Street. **BRISTOL:** ROBERT STOTESBURY, 114, Redcliffe Street. **CARDIFF:** BELL and Co., West Bute Street.

BELL'S ASBESTOS DAGGER PACKING



PATENT No. 15,493.



Every 10 feet has Label as above, and bears our Trade Mark.

Under this registered title are included the inventions of Mr. Field; and experience has proved them to be the MOST EFFICIENT DURABLE, and ECONOMICAL PACKINGS ever made. They constitute such a combination of Asbestos and India-rubber as secures the maximum of elasticity and heat resistance; and they are, therefore, UNEQUALLED FOR EVERY KIND OF ENGINE. These Packings are being universally used by most of the leading Steamship Companies throughout the world for ordinary Compound, Triple, and Quadruple Expansion Engines of the latest types. The packings are composed of rolled Asbestos Cloth, but the India-rubber is placed in two forms to suit various cases

IN ORDERING STATE WHETHER SQUARE OR ROUND IS REQUIRED.

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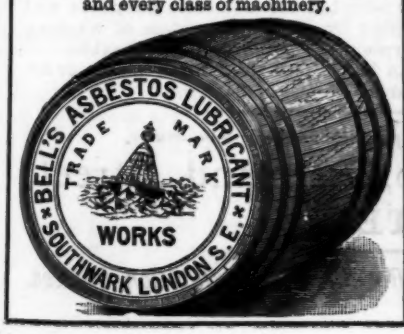
SOUTHWARK, BELL'S ASBESTOS. LONDON, S.E.

BELL'S ASBESTOS
YARN AND SOAPSTONE PACKING
the BEST LOCOMOTIVE PACKING made.

BELL'S
COMPOUND HYDRAULIC PACKING
Is specially suited for
Hydraulic Machinery, Accumulators and Ammonia and all Pumps.

BELL'S ASBESTOS LUBRICANT
Is unequalled
For Steam-Engines & Cylinders, Gas-Engines, and every class of machinery.



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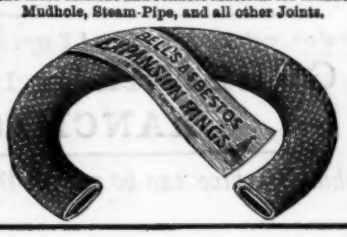
The reputation of this Lubricant is based on the experience of thousands of users, which places it far in advance of those who rely only on mere laboratory tests.

ASBESTOLINE IS THE CHEAPEST MOST EFFICIENT, CLEANEST MOST INODOROUS AND SAFEST LUBRICANT.

ASBESTOLINE HAS SAVED 90 PER CENT. OVER OIL. Has been used for all purposes, AND BEATEN ALL OTHER LUBRICANTS IN ACTUAL WORK.

BELL'S ASBESTOS
EXPANSION SHEETING
RINGS, AND TAPE.
Is the most efficient and reliable Material for Manhole, Mudhole, Steam-Pipe, and all other Joints.



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Will reduce loss by radiation and saves 40 per cent. of fuel.
Is superior to any other, and saves its cost in a few months.

Can be applied again after many years' service. Is sent out dry in bags: therefore cheaper than others sent out wet.

ALL BAGS ARE MARKED AS ABOVE.

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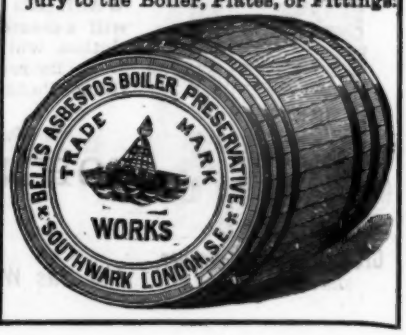
BOILER PRESERVATIVE
Will effectually keep Boilers clean, and remove any Incrustation, without injury to the Boiler, Plates, or Fittings.



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GAS and WATER ENGINEERS,

Manufacturers of and Contractors for the Maintenance of

PUBLIC LAMPS & LANTERNS;

GLASS—Flint Opal, and Bent in Stock, and Cut to Sizes.

WELL LAMPS, STREET NAME TABLETS,

LAMP COLUMNS, HEAD IRONS, PUTTYLESS LAMPS,

LANTERN COCKS, REGULATORS.

Improved High-Power Lanterns for Lighting Street Refuges and Open Spaces.

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LAMPLIGHTERS' TORCHES.

PROPRIETORS AND MANUFACTURERS OF

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PUTTYLESS STREET LAMP.

This Lamp may be supplied fitted with clear opal, or ribbed glass, *as also with enamel tops* if required. The necessary fittings for altering existing Lamps to this system can be supplied at moderate prices.

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Works: 18, STEPHEN STREET, TOTTENHAM COURT ROAD, W.

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And all classes of GAS PLANT,

REVOLVING BRUSH SCRUBBERS, FOUR-WAY VALVES.

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TELEGRAPHIC ADDRESS, "GAS, LEEDS."

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LIMITED,

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MAKE

RETORT LIDS

OF ALL FORMS AND SHAPES IN IRON OR STEEL

BY SPECIAL HYDRAULIC MACHINERY.

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SIXTY PER CENT. ECONOMY IN GAS LIGHTING.

The Schülke Regenerative Lamp

FOR

DOMESTIC AND EXTERNAL LIGHTING.

The only Regenerative Lamp employing the Common Flat-Flame Burners.

Lamps giving 20-Candle power consume less than four feet of Gas per hour.

PURE WHITE & PERFECTLY STEADY LIGHT,

NOT AFFECTED BY DRAUGHTS.

Suitable for any existing fittings (Brackets or Suspending).

Can be fixed in a few minutes.

May be seen at the Offices of the

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LIMITED,

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Where Price Lists and full particulars may be obtained.

IMPORTANT TO GAS COMPANIES.

Hiring out Specialities for Gas Consuming.

Greenall's Steam Washer.
(ORIGINAL PATENT.)

Companies desirous of extending the use of Gas should see the "GREENALL" WASHING MACHINE. The Washer is admirably adapted for domestic purposes, and will execute the work in one-third the time occupied by any other system of washing clothes, while the labour is almost nil. To Laundrymen, the Machine is invaluable.

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The Gas Washing Machine can be seen at the Royal Military Exhibition, Chelsea.

WILLIAM INGHAM & SONS,

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Near LEEDS

Have confidence in drawing the special attention of GAS ENGINEERS to the following advantages of their Retorts:—

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SUPPLY FROM STOCK

CAST-IRON RETORTS,
AND ALL KINDS OF GAS-WORKS APPARATUS.

SOCKET-PIPES FOR GAS OR WATER PURPOSES.
FLANGE PIPES FOR STEAM.

Sole Manufacturers of LYON'S 'PATENT' GAS MAIN SYPHONS.

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ATTERTON'S PATENT APPARATUS for CHARGING RETORTS.

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Specialities in CARBONIZING PLANT.
GENERATOR AND REGENERATOR FURNACES.

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"THE METEOR."

NEW HIGH-POWER GAS-LAMP.
Westphal's Patent.

Gas Companies should hire these Lamps to their Consumers, and introduce them for Street Lighting as a rival to the Electric Light, as they do not get out of order, are most economical, and the Burner being a circular slit does not choke up.

Particulars and Prices Free.

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A SPECIAL COMPOUND

FOR THE CURE OF STOPPED ASCENSION-PIPES,

A couple of charges of which will clear a stopped pipe, and an occasional charge keeps them clean, and also increases the make per ton and the illuminating power.

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GASHOLDERS, Telescope and Single-Lift, any size. Some of the largest in the Kingdom erected by this Firm are giving the highest satisfaction.

PLANS and SPECIFICATIONS furnished for **Extensions** and **Enlargement** of existing **Works,** adapting them to the most **Improved** and **Modern Principle** of **Gas Manufacture.**

PURIFIERS, CONDENSERS, WASHERS, ENGINES and **EXHAUSTERS, STATION METERS** and **GOVERNORS,** manufactured and erected.

Makers, by permission of that eminent authority **Mr. GEORGE LIVESEY,** of his **CELEBRATED PATENT WASHER,** highly approved by all the Engineers of Works where adopted. Largely in demand.

Special reference and attention are invited to our

WET AND DRY METERS,

which have acquired a high reputation for the **excellence** of Materials and Workmanship; their **durability** and **accuracy** of **Register** guaranteed. They are used by several of the **London Gas Companies,** and over **200 Provincial Gas Companies.**

Price Lists, Specifications, and Estimates provided for any work appertaining to Gas Lighting, from the Retort-House to the Drawing-Room.

W. PARKINSON & CO.,

Having purchased the old-established Lamp and Meter Business of

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IMPROVED LAMPS FOR STREET LIGHTING

IN EVERY SIZE AND STYLE.

STREET LAMP METERS. LAMP COCKS.

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PATTERN SHEET AND REFERENCES SENT ON APPLICATION.

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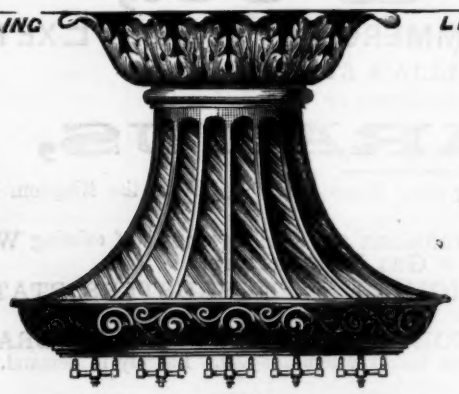
SUN-BURNER OR VENTILATING CEILING LIGHT.



HIGHEST ILLUMINATING POWER AND PERFECT VENTILATION.

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ECONOMICAL IN FIRST COST AND VERY DURABLE.

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[See Advt., p. 833.

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